Concrete

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Wanted, Builders—The Concrete Masonry House Today, the Fireproof House Tomorrow

By Harvey Whipple
Editor Concrete

THE almost spectacular ascendancy of concrete building units—block, brick and structural tile—must be noted first of all in any general survey of the progress of the concrete house in public favor. Such a survey must, however, be so divided that two entirely different elements of that progress may each be seen in its proper light. The concrete masonry walled house which displaces other kinds of masonry, besides frame and veneer, is one kind of development; the other is the fireproof house with concrete floors and other unburnable features.

A few years ago the use of concrete building units, as compared with the use of traditional clay brick, was almost negligible. Through its district representatives in all parts of the country, the Portland Cement Association compiled data which show that production of concrete block and structural tile of all styles and dimensions reduced to a volume term of 8 x 8 x 16 in. blocks amounted in 1920 to 50 million; in 1921 (a more complete survey), 175 million; in 1922, 297 million; and in 1923, 385 million. The production of concrete brick in 1923 is figured at 155 million. Reducing block to brick (1 block equalling about 13 brick) the 385 million block are the equivalent of a little more than 5 billion brick, and, adding the 155 million of concrete brick, we have a total of concrete building units (not including dimension stone) equivalent to more than 5 billion, 185 million for 1923. Compare this with an estimated common clay brick production in 1923 of 6 billion, to see how far concrete building units have come.

The Increase of Masonry Construction

It is not to be assumed, however, that concrete units are displacing clay brick at any such rate. Concrete building units are, to a very considerable extent, swelling the total of masonry construction. Only in that sense is the concrete unit displacing clay brick and other clay units to any large extent. It is getting business that clay units might have had if the clay industry had put a greater promotional effort behind its products and had no such formidable competition.

Lumber is not so plentiful as it was. To its production cost must be added hundreds and even thousands of miles of freight haul that did not at one time exist. Wood is too valuable a material to be squandered for uses which are better served by masonry at only slightly, if any, greater cost.

This situation does not have to be forced; it exists. When the cost of masonry and wood frame come just a little nearer or more generally to an even cost balance by (1) the increased efficiency and production of the concrete manufacturers, (2) the further depletion of accessible timber, and (3) a more general appreciation of the real economic value of masonry dwellings through longer life, lower upkeep and minimum fire risk, the masonry house will progress at a far greater rate. This will begin in the regions most remote from the timber supply; those areas of remoteness will go on increasing.

In all this inevitable progress of masonry construction, concrete could not so soon have stood alongside its elder brother clay without certain other important and wholly internal elements of progress within the concrete industry.

Basically, the progress of the concrete building unit is from an economic condition which made room for low cost masonry. Added to a natural demand, however, powerful forces—very opportune forces—have been at work. The concrete industry with a growing sense of its possibilities has taken hold of the scientific problems of concrete; learned more for itself of how to make it; what may be expected of it; and, in turn, has taught the general public what to expect of it. The industry has had to combat a tradition that concrete walls make damp houses. The worst of it was, the tradition was founded on a fact—the hard-to-forget fact of bad workmanship. A story:

"Concrete of Course"

An astute manufacturer of concrete sewer pipe was trying to sell his product to a certain engineer. He encountered stubborn opposition. A concrete pipe line somewhere, sometime, in this engineer's experience had failed. An acknowledged job of poorly made pipe.

The engineer and the pipe manufacturer descended from an office to the street. Their route, afoot, took them over a concrete sidewalk on a busy thoroughfare. The concrete sidewalk had gone to pieces, obviously poor material.

"What are you going to do about a sidewalk job like this?" asked the pipe manufacturer.

"Rebuild it," said the engineer.

"What with?" shrewdly queried the other.

"Concrete, of course."

That reopened the whole subject, and the engineer bought concrete pipe.

Rapid Technical Progress

Many weak, porous, friable and readily disintegrated concrete blocks have been made, sold and used. Not only that; good blocks have been badly laid up in the wall with joints that let the weather through. They have been plastered direct on the inside, with the resulting insufficient insulation. The whole industry has suffered from these errors of greed and ignorance—ignorance in either case, for there is none more ignorant than one who expects to prosper permanently on anything but satisfied customers.

The industry has developed through intensive technical study, in the American Concrete Institute and in small local groups, far better standards, so that block makers know better how to meet demands of quality. We have better machinery. With these to work on, better brains and more capital have been attracted to the field. The better technical standards, the increased efficiency of production, the human calibre necessary to turn these to account in meeting an economic necessity—these have given us a concrete masonry house about which we need have no misgivings.

A remaining factor is that of active promotion. The biggest single factor of promotional effort is the Portland Cement Association. Its frank object is to increase the use of cement. Roads provided the immediate course of least resistance, and promotional effort was lavished on roads. The concrete road is established, for the present at least, beyond quibble—almost everybody is sold on its value. The concrete house idea languished.

Concrete House Promotion

Four years ago, new economic opportunities being sensed, promotion began, a little timidly at first, on the concrete masonry house. This promotion has been coupled up with intensive study of manufacturing conditions among about 6,000 block makers—working chiefly with those who showed promise of progress through competent and intelligent management. There was study of the best use of available machinery, and of the underlying principles of aggregate mixtures and curing. Much has been accomplished by the Association through assisting in local organizations of products manufacturers, and by fostering the erection of exhibition houses of concrete in house building shows in many of the larger cities. Newspaper enterprise has helped in New York, Detroit, Minneapolis, and elsewhere in the wide publicity connected with the erection of model houses, the newspapers discovering in concrete the best material from a cost and durability standpoint. The "Home, Sweet Home" house in Washington, D. C., was built of block and stucco, as an example, to a homebuilding nation, of the last word in modern home design. By having the material ready and by selling the moving spirits in the enterprise on concrete's quality, the industry enlisted the Federation of Women's Clubs on the side of concrete. The "Home, Sweet Home" house has advertised the concrete house throughout the United States as a thing of this kind has probably never been advertised before. There are poems about it; it is in the movies; tens of thousands of people have gone through the structure in Washington; reams and reams of publicity have been possible—not only when the house was built and the cornerstone laid, but when at the time of dedication and since, numerous Governmental dignitaries from the President down have been identified with the Better Homes movement which it typifies, and had their pictures taken at its doorstep.

Such favorable promotion helps to explain the rapid increase in the public's acceptance of concrete block, structural tile and brick for houses. It may at least be said to have put a sharper edge on an already keen economic appetite.

* * *

That is but one part of the picture of concrete house progress. Concrete block was selected by competent judges of value for the extensive work in rebuilding Halifax, where cold and damp is commonly dispensed as a weather condition; for the whole town of Morgan Park, near Duluth, where cold winters at the head of Lake Superior severely test any method of construction; in Southern California for a constantly increasing number of dwellings, where dry summer heat and very wet winter rains bring the seasons round; in Florida for Coral Gables, a whole town near Miami, in a climate again entirely different, with damp heat. Improved standards for concrete; better and more nearly standardized control of quality, a more general knowledge of the use of concrete, together with its acceptance for the work of the most discriminating, is breaking down tradition. Concrete is now taken for granted as a house material. The use of the unit has sold the *material.* Good architects have studied its use, so that beautiful results are possible. They do not shudder as they did at mention of concrete.

The Fireproof House

So, with the public fast being sold on the material, the next step is in order. The masonry wall house is more fire-resistant than is the frame house, but walls don't protect the ready fuel in floors and partitions when the fire starts inside—as more than 90% of fires do. The really fireproof house must have fireproof floors and partitions—whether the walls be of masonry units or monolithic.

People are more interested in this fireproofness as time goes on. Here and there a progressive builder finds he can put in fireproof floors at little more than the cost of the usual type. Some builders find fireproof floors actually cheaper than frame when the finished surface is concrete rather than wood on concrete.

As this knowledge of how to build them spreads among builders, when they are no longer afraid to bid on such a job for fear they will lose money, or when people find that concrete floors will take as fine a color and as fine a polish as oak and make as beautiful a background for rugs, or when both these developments have been achieved—the fireproof house will make much more rapid progress.

This House Building issue of CONCRETE records, as have others in the past, examples of fireproof house construction that will bear most careful consideration.

GOOD HOUSES FIRST—CHEAP ONES LATER

Most notable, perhaps, is the work of Hueber Brothers, Syracuse, New York. It is notable because it has been consistent progress over a period of five years. Much of the Hueber success with fireproof house construction in Syracuse has been due to the mental attitude with which the problem has been approached. It has not been with the idea to produce a cheap house. It has not been from the viewpoint of the concrete enthusiast. The Huebers became enthusiastic about concrete only as they worked out the problem to build permanent houses which would compare favorably in every way—beauty, cost, equipment, finish, modern architecture and appointments—with the best houses on the street. They have built and sold at a profit without difficulty to "the best people," as the saying goes. Building for "the best people" is the way, as this magazine has often pointed out, to get a new building idea established. All others will follow. Start out to emphasize the cheapness, and the people who aren't attracted by cheapness are very slow to take favorable notice.

BUILDERS—NOT SYSTEMS

What the fireproof house movement needs is not more *systems* but more builders who know their job. A system produces no more than the shell of a house, and the shell, structurally important as it is, represents but 20 to 25% of the cost of the complete job. This magazine has recorded the experimental stages of scores, probably hundreds, of systems—most of which were to a degree workable, some full of promise. What is needed is *builders* of *houses*. This magazine's advice to every man who comes with a new system is to go out and use it—build houses with it. Those who learn quickly the job of building fireproof houses will be well rewarded. The tide has turned to concrete.

Automobiles vs. Homes

THE National Automobile Chamber of Commerce is distributing a chart showing the purchasing power of a dollar now, based on 1913 dollar value. It shows that the 1913 dollar will buy 111 cents worth of automobile and only 45 cents worth of frame building, 46.3 cents worth of brick building, 48.5 cents worth of concrete building and only 61.3 cents worth of the general cost of living. The same 1913 dollar will buy 101 cents worth of gasoline and 123 cents worth of tires.

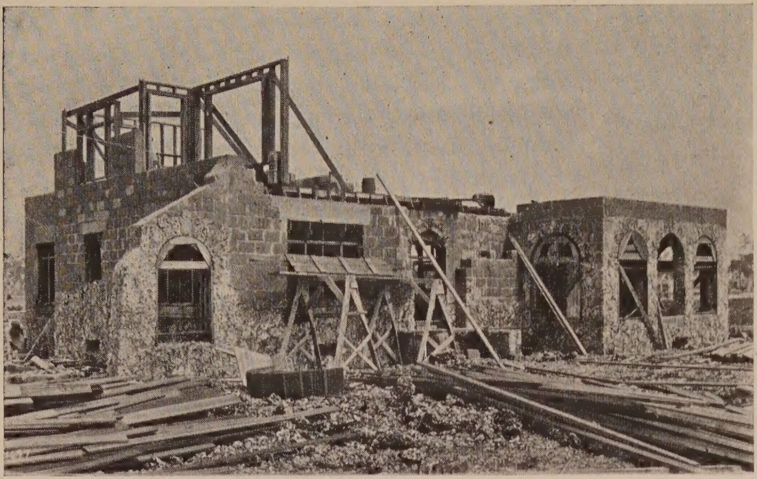
The building industry, with the slogan: "Own a Home First," will know how to answer this kind of arithmetic.

The dollar invested in the automobile will be all but gone at the end of five years, not to mention the worn-out tires, the gasoline and so on.

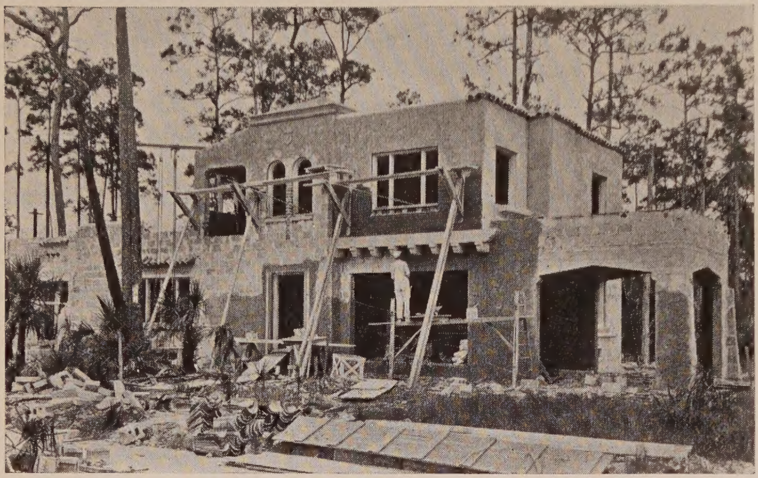
The dollar carefully invested in building, with a low upkeep, should be worth at least 80 cents at the end of five years, taking no account whatever of the increased value due to community development which careful investment almost always insures.

Besides—and this is most important—the saving in rent in five years will buy a better automobile—or if Mr. Householder just *must* have the car now, the *anticipated* saving on the cost of living by home investment first, will finance the automobile.

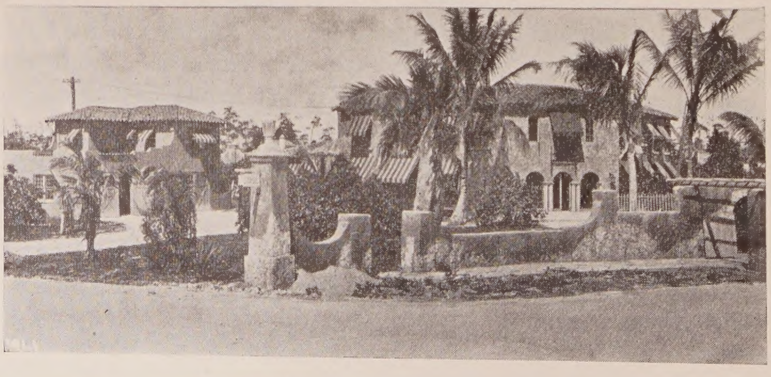
The comeback of the building industry is this: "Own a Home First and Have Both."
—Courtesy *Building Materials*.



Concrete Block and Stucco the Basis of Most of Several Hundred Masonry Houses Being Built in a New Community Near Miami



Coral Gables, Florida—the work of one man—George E. Merrick



Coral Gables, Florida—

A New Community—Is All Masonry and About 85 Percent Concrete

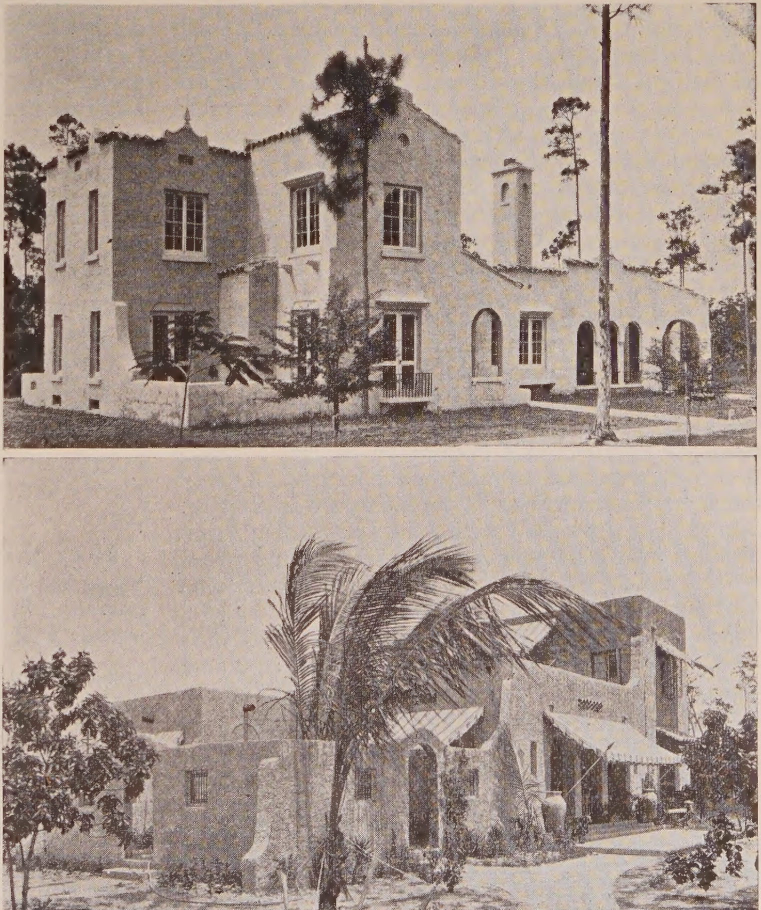
Coral Gables is a suburban residential development, comprising 2,500 acres, about four miles southwest of Miami, Fla., to which it is expected it will soon be annexed. Construction work there is characterized by architectural unity in one general scheme of architecture and by the use of masonry only—no frame buildings. The greater part of the work thus far is with concrete block, natural rock and stucco.

It is planned to make this a complete little city in itself. It already has its own water supply (6 artesian wells). One golf club is on the tract and another is under construction. Twelve large business buildings were constructed in the commercial section during the last year, including a fine hotel, grammar school and printing office. A bank, post office and transportation building are now under construction.

Work has been under way on Coral Gables for two years, and it is expected that from three to five years will be required to complete it. More than 500 homes, ranging in value from $5,000 to $40,000 have been built; there are 60 miles of streets, and more than 40 miles of concrete walks. Most of these walks are colored a light pink by the addition of mineral coloring matter to the wearing coat.

The architectural motif of the entire development is Spanish. The setting is appropriate, being rolling ground with a profusion of tropical and sub-tropical vegetation. A large portion of Coral Gables is now covered with bearing avocado, grapefruit, mango and other tropical fruit trees, and many varieties of palms line the highways. There are also pines, live oaks and wild figs. Winding boulevards encircle the entire tract, diagonal streets make every part accessible, and vistas of tropical foliage are everywhere. An extensive planting program is in progress. The traditions, climate

Not Only the Houses, But Many Community Buildings of Concrete Masonry, with Spanish, Moorish and Venetian Motifs



Coral Gables Is to Have the Look, as Soon as Completed, of Having Aged for a Generation —Mottled Stucco and Old Roof Tile Enhance the Effect

and vegetation make an ideal background for a Spanish type development.

The names of all the streets and boulevards are Spanish, and plazas are placed at intervals, decorated with Spanish fountains, gateways, walls and pergolas.

In the buildings, the Spanish, Moorish and Venetian motifs are also carried out. More than eight architects have designed houses for Coral Gables, the owners encouraging this for they want variety, but every home must meet the conditions both as to building material and design.

The object of the builders is to make the houses take their places quietly and restfully in their environment. An effort is made—successfully—to reproduce the age-toned walls of old Spanish cities. Tile imported from Cuba (taken from old buildings) is used for roof covering. To convey this impression of age, a stucco covering has been used on most of the houses. A rough trowelled finish of ordinary cement stucco is first applied, and this is painted with three coats of coloring material. Usually there is a base coat of some strong color—red, green, or blue—and a second coat of some lighter color. This is placed on the first coat in varying thicknesses, so as to allow the base coat to show through in places and to show partly in other places. A third color is used to blend the other two and to place marks below eaves, etc., imitating the stains left by water drippings. Denman Fink, whose specialty is Spanish art and architecture, was employed as color expert to advise on the selecting and blending of colors. The coloring "paint" used consists of a mixture of water, mineral coloring matter, cement, waterproofing material and hydrated lime. It is placed on the stucco with a brush.

Building Restrictions

The tract is divided into sections on which houses of certain costs may be built—$4,000 is the minimum value in the minimum section, and $8,000 is the minimum value in the preferred section. There are also building line and lot size restrictions for various houses.

No frame dwellings are permitted; this because it is desired to establish a uniform degree of quality and to promote the desirability of the property. Building materials are limited to stone, brick and concrete block. Brick does not lend itself well to Spanish treatment; native stone is very desirable, and about 15% of the houses are built of it, but it is quite expensive to cut and to place; concrete block covered with cement stucco is by far the most favored building material. Of the 500 homes already completed approximately 85% are of stucco on concrete block. Experience has shown this to be the most economical and satisfactory building material. Coral Gables has its own block plant, with a capacity of 6,000 to 8,000 blocks per day.

More than seven-eighths of the houses have been built by the Coral Gables organization for prospective owners. With their own block plant, they can build houses at a lower cost and they can guarantee quality.

Coral Gables will allow other contractors to build homes on the subdivision, but retains general supervision of design and construction. It employs a construction superintendent with two assistants. His duties are to supervise all construction, so the home owner may be assured of quality construction, the service rendered by these inspectors being paid for in the price of the property.

When a prospective buyer decides to build in Coral Gables, he selects the approximate price of the home he wants and pays 25% of the cost. Then after he moves in he pays 1% of the cost per month until the balance is paid. The cost to the purchaser includes architect fees, financing, building supervision, etc.

The work of developing Coral Gables is progressing rapidly. Before December, 1924, it is expected that 300 additional houses will be built. In 1922 only lots were sold, but in 1923 houses were built for sale, and more than $5,000,000 worth of property has already been sold. In Coral Gables extensive development program more than $7,000,000 has already been spent, and at least $20,000,000 will be expended before all of the great architectural features are completed.

A beautiful Venetian pool for open-air bathing has just been completed. It is 250 x 200 ft. with floor and walls of native stone,cemented with gunite and artistically colored in the same way. All home owners in Coral Gables are shareholders in its public utilities, its golf club and its play-grounds.

The project is the "child of the brain" of one man—George E. Merrick—and he retains personal supervision of the entire scheme. Mr. Merrick was the owner of the tract, and it was his idea to develop an ideal residence suburb at that location. Permanency and beauty are the keynotes of the development.

For the foregoing, CONCRETE is indebted to Edward T. Purcell, advertising manager for Coral Gables, and R. E. Taylor, the general superintendent in charge of construction.

John McClatchy, Builder of Homes, Philadelphia, an Extensive User of Concrete

(STAFF ARTICLE)

PHILADELPHIA LOVES ITS BEAUTIFUL STONE WALLS—STUCCO COVERS A GOOD DEAL OF THE CONCRETE BLOCK USED IN COMBINATION

John H. McClatchy—"Builder of Homes"—Philadelphia, has a knack of making people want to live in the homes he builds.

And as that knack is something that other home builders want to learn, we're going to tell here something of how he builds and how he sells.

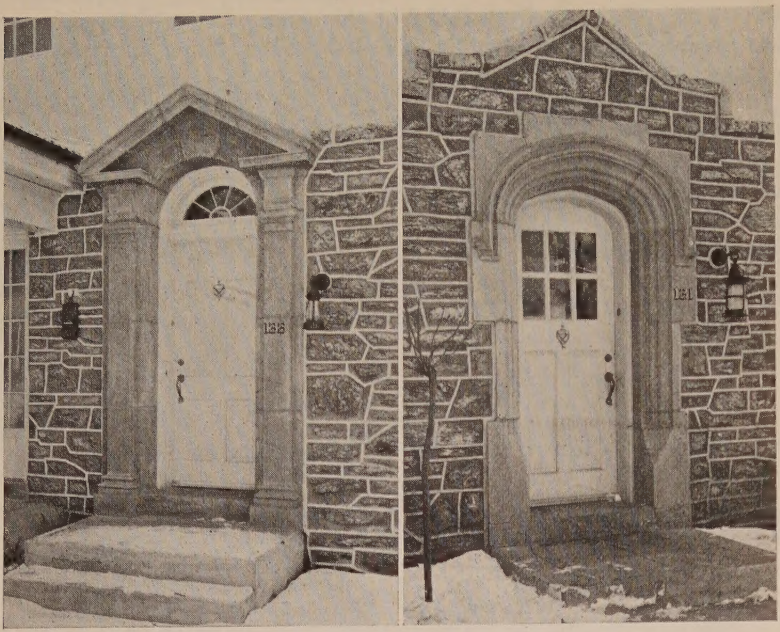
McClatchy didn't start out to be a builder of *concrete* houses—nor has he ended that way—*yet.* He has come to use a large amount of concrete in his houses just by ordinary process of housebuilding evolution. That evolution, if we understand him, has been a natural outcome of an effort to build substantially, a great many houses (probably two million dollars worth in a year); to use good materials, bought or made in large quantities; to sell quickly by very extensive advertising and to make up very handsomely in volume for sometimes rather slender margins of profit.

Philadelphia has been a user of brick and stone. Philadelphia likes stone houses. Stone in Philadelphia is a tradition—and Philadelphia has beautiful homes. Stone is dug out of the cellar with which to wall up the excavation—thick walls. Most basement walls at least are of stone. It is rough stone, laid up roughly and rapidly. A good deal of this work is badly done. Very often the mortar used is of a very inferior quality. Watertightness often depends a great deal on the pointing—there isn't much mortar inside.

McClatchy built up an organization. He employs an expert adviser in technical construction matters. He is careful about his sand. McClatchy built stone basement walls and stone upper walls. In earlier years he used a good deal of brick and tile. Then he bought big automatic machinery (Besser) and began making concrete block. He employed a concrete ornamental trim stone man of years of experience and made concrete trim stone, chimney caps and other architectural features. Roofs bothered him some—a good roof for less money? He bought automatic machinery (Domine) and began making concrete roof tile.

But he didn't force these things down Philadelphia's conservative throat. He has blended Philadelphia's time honored stone with concrete block. The buyer of a home is not an expert in home building. McClatchy doesn't advertise technical details to the Philadelphia public. He advertises well built, masonry homes. He

ONE OF McCLATCHY'S SAMPLE HOUSES—A DOUBLE ENDER



Concrete Trim Stone, as Used with Natural Stone Walls, to Frame the Doorways of McClatchy's Houses, Philadelphia

advertises *living qualities*, not controversial prejudices. He advertises those things which the public is capable of understanding.

The public understands "solid masonry"; it understands "solid brass hardware"; it understands "cuddle-up" fireplace nooks and it understands cedar closets; it believes that metal weatherstrips are almost a *luxury*, belonging only with good houses; it is sure that copper gutters and rainspouts denote a quality job of house building.

You read in the paper about "McClatchy homes." He buys lots of newspaper space. When he introduced the innovation of radio outfits something over a year ago as part of the built-in equipment he got a good deal of gratuitous advertising.

He sends an architect over to Europe scouting for good architectural ideas. He keeps an expert busy on new ideas for building progress. He investigates new things constantly and acts quickly. He not only operates a block and trim stone factory and a concrete roof tile plant but he runs a mill on original lines and effects a good many economies.

His ads are never hum-drum. Go out to one of his sample houses and in each room—every way you turn you will find small neatly printed placards each driving home some appealing fact of which the following are samples:

A real open fire-place for real logs positively will not smoke.

* * *

The inglenook gives the fire-place that comfy cuddle-up feeling; it brings the book where you want it and *makes* a fire-place.

* * *

All of our homes are metal weather-stripped throughout.

* * *

Notice our floorings are hard wood.

* * *

Notice the unusual number of electrical outlets in this house; there are four in this room.

* * *

Where have you seen a more cheery house, not a dark corner anywhere.

* * *

The handsome lighting fixtures are from the Horn & Brannen Co.

* * *

The only house where the millwork is saturated with linseed oil to prolong life and prevent shrinkage.

A one-piece kitchen sink 5 ft. in length and 36 in. high.

* * *

This kitchen will be electrically ventilated.

* * *

This kitchen dresser is especially designed and made in our own mill.

* * *

Notice all our hardware is Corbin solid brass.

* * *

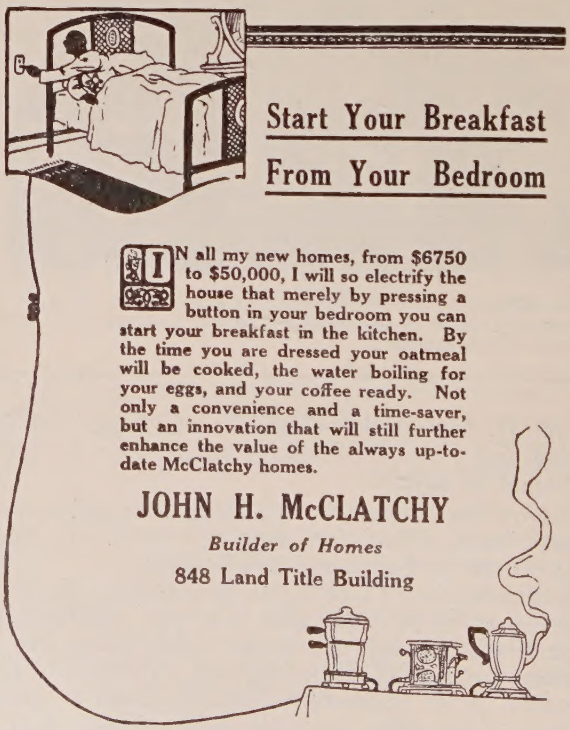
The rain gutters, conductors and flashings used in our homes are all copper.

* * *

A bath-room complete—towel-bars, soap dishes etc., all installed.

* * *

Something you have hoped for—a big roomy cedar-closet.



Start Your Breakfast From Your Bedroom

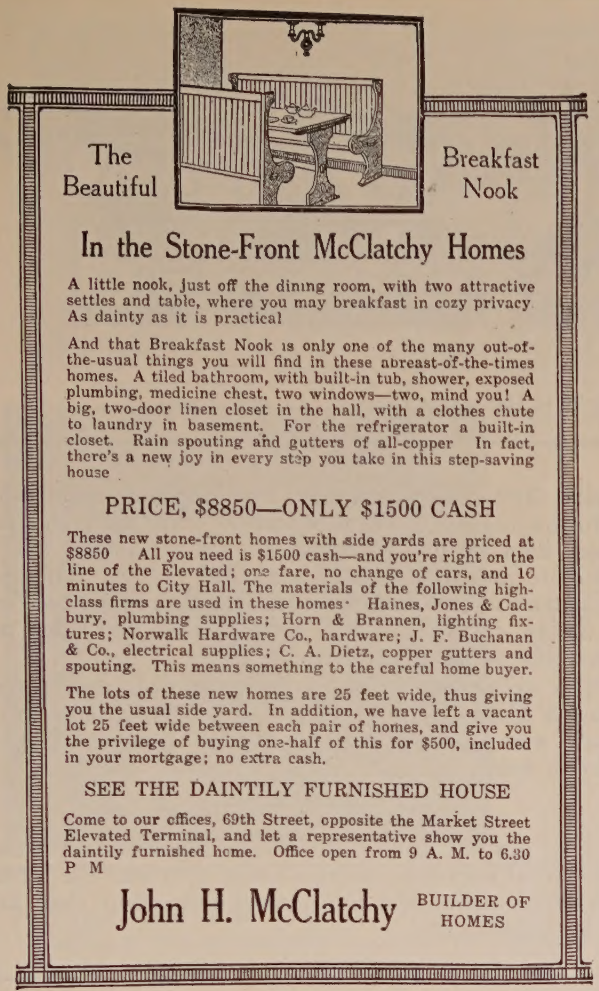
In all my new homes, from $6750 to $50,000, I will so electrify the house that merely by pressing a button in your bedroom you can start your breakfast in the kitchen. By the time you are dressed your oatmeal will be cooked, the water boiling for your eggs, and your coffee ready. Not only a convenience and a time-saver, but an innovation that will still further enhance the value of the always up-to-date McClatchy homes.

JOHN H. McCLATCHY

Builder of Homes

848 Land Title Building

This is One of the McClatchy House Ads—Reduced in Size



The Beautiful Breakfast Nook

In the Stone-Front McClatchy Homes

A little nook, just off the dining room, with two attractive settles and table, where you may breakfast in cozy privacy As dainty as it is practical

And that Breakfast Nook is only one of the many out-of-the-usual things you will find in these abreast-of-the-times homes. A tiled bathroom, with built-in tub, shower, exposed plumbing, medicine chest, two windows—two, mind you! A big, two-door linen closet in the hall, with a clothes chute to laundry in basement. For the refrigerator a built-in closet. Rain spouting and gutters of all-copper In fact, there's a new joy in every step you take in this step-saving house

PRICE, $8850—ONLY $1500 CASH

These new stone-front homes with side yards are priced at $8850 All you need is $1500 cash—and you're right on the line of the Elevated; one fare, no change of cars, and 10 minutes to City Hall. The materials of the following high-class firms are used in these homes: Haines, Jones & Cadbury, plumbing supplies; Horn & Brannen, lighting fixtures; Norwalk Hardware Co., hardware; J. F. Buchanan & Co., electrical supplies; C. A. Dietz, copper gutters and spouting. This means something to the careful home buyer.

The lots of these new homes are 25 feet wide, thus giving you the usual side yard. In addition, we have left a vacant lot 25 feet wide between each pair of homes, and give you the privilege of buying one-half of this for $500, included in your mortgage; no extra cash.

SEE THE DAINTILY FURNISHED HOUSE

Come to our offices, 69th Street, opposite the Market Street Elevated Terminal, and let a representative show you the daintily furnished home. Office open from 9 A. M. to 6.30 P M

John H. McClatchy BUILDER OF HOMES

Mr. McClatchy Sells Aggressively in the Daily Press and Otherwise

McClatchy House

He sends out an attractive folder—the cover a beautiful landscape from a photograph. "Approaching McClatchy Homes." People *do* respond to "*approach*" when home hunting. "Reached by the most picturesque drive in Philadelphia." says McClatchy. Another circular gives such information as this:

Restricted Neighborhood

Every purchaser of a home should give first consideration to the neighborhood in which he would care to live. At 69th and Market Streets, where six high speed lines meet and go everywhere, are sixty city blocks of ground restricted to residences, schools, and churches by deeds recorded by the Girard Trust Company, trustees.

The business fronts along Market Street are already occupied by stores, theatres, banks, office buildings, etc.

Cobb's Creek Golf Course is only a few blocks away, and there are the Aronimink and three other golf courses within ten minutes ride.

The Homes

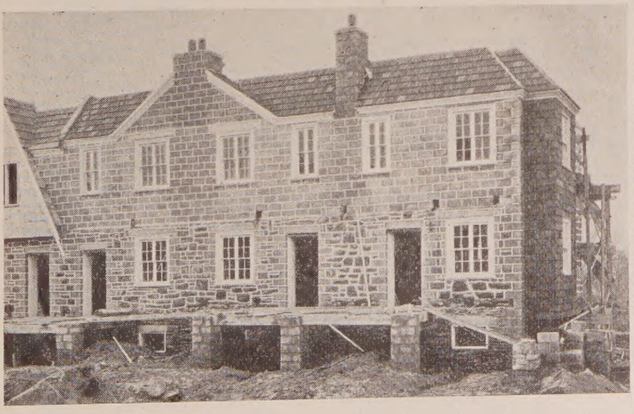
These homes have *insulated roofs*, a distinct advancement in building construction—they keep your house warm in winter and cool in summer. They are of all-masonry construction, with side yards. *All-copper gutters and spouting, Chamberlain metal weather-stripping throughout.* Corbin brass hardware, Haines-Jones-Cadbury plumbing, attractive lighting fixtures, not the regular patterned millwork you see everywhere, but millwork specially made in our own mills.

Prices and Terms

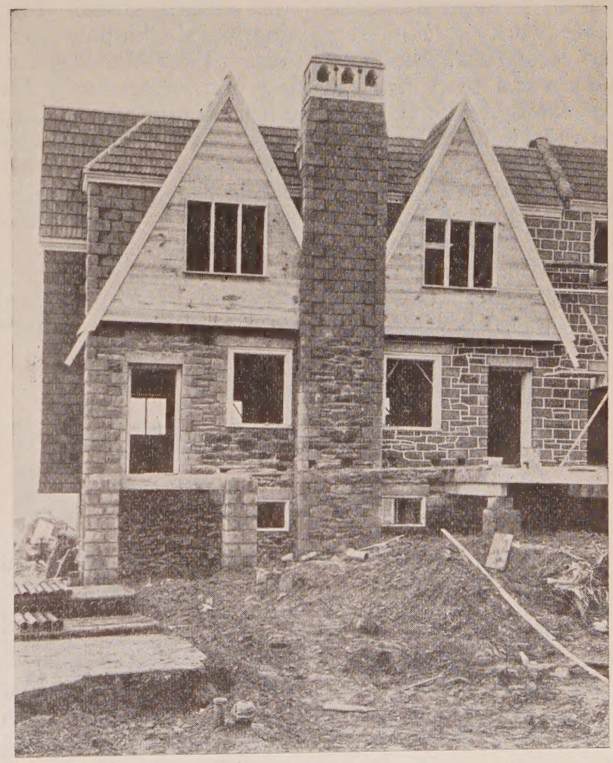
The price of these homes is $8900; a moderate initial payment. Then they cost you only $44 per month, plus $12 a month to pay off your mortgage (which is cheaper than rent.) Expenses of financing paid by us.

The features of some of the newer McClatchy houses are mentioned in a letter from Mr. McClatchy:

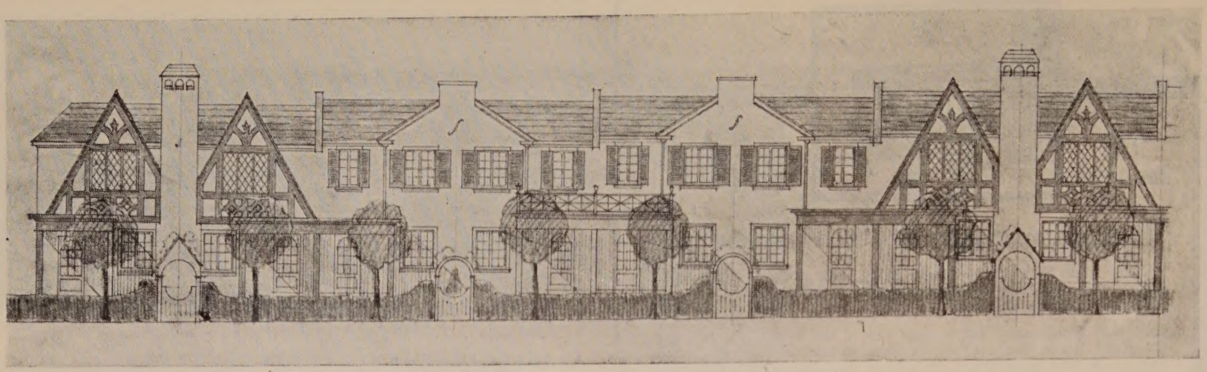
They are stone for one story and concrete block above on the front with rear walls of concrete block. These block make a nice appearance after being pointed, as we point stone work. The party walls between the houses are also concrete block—solid. In fact,



A Part of One of the Many McClatchy Row Type Developments—Stone, Concrete Block and Stucco



McClatchy Chimneys Are Set Off with Special Concrete Caps of Original Design



Concrete Block and Stucco with Concrete Tile Roof for Row Type Houses, so Common in Philadelphia

face and party walls are both solid block—not hollow block. We believe that a solid block laid in 1:3 cement mortar makes a much more substantial job than the hollow block. The foundation walls are 20-in. stone walls laid in a 1:3 cement mortar. The battlement walls which extend above the roof between houses are covered with copper and all the rain spouting is of copper. We have over each window frame a piece of sheet lead 1 ft. wide which is bent up inside the wall and extends out to the front of the window frame. Another unusual thing we are doing in these houses is to use metal lath ceilings in both the first and second floors. The houses are 16 ft. wide. The ceiling in the first floor where 2x10 joists are laid 16-inch centers have 1x2 stripping lath nailed the opposite way on 12-inch centers and to this gridiron effect we attach the metal lath. On the ceiling of the second floor the rafters are laid 12-inch centers, to which is attached the metal lath.

These houses sell for $6750 each on lots which are worth about $1100 each. The houses have every modern appointment, including hardwood floors, tile bath, built-in tubs. A garage is under the rear of the house, with metal lath partitions all around it, and there is a rear concrete driveway. The lots are 16 ft. x 100 ft. The houses are finished with poplar trim, and have three coats of Dutch Boy white lead and one coat of Lucas White Seal enamel.

Most of the McClatchy houses are double, some are "quads," some are of the row type and yet he builds a good many single residences whose cost runs well up into the tens of thousands. Concrete block now go into a good many walls—sometimes covered with stucco, sometimes blended with natural stone. Trim stone work is evident in doorways, chimney caps, and numerous special features. Two-tone concrete tile cover a good many of the roofs. Eventually Mr. McClatchy will make the leap from tradition and adopt that additional use of concrete which will give him what is essentially a fireproof house—concrete floors. Mr. McClatchy will do this because he is a progessive builder, because he has an organization that is accustomed to working out new building ideas. Not that the fireproof floor is new, but it is far from common in real estate development undertakings, and it is something that the public is preparing itself to accept and appreciate.

Mining Company Erects Concrete Buildings

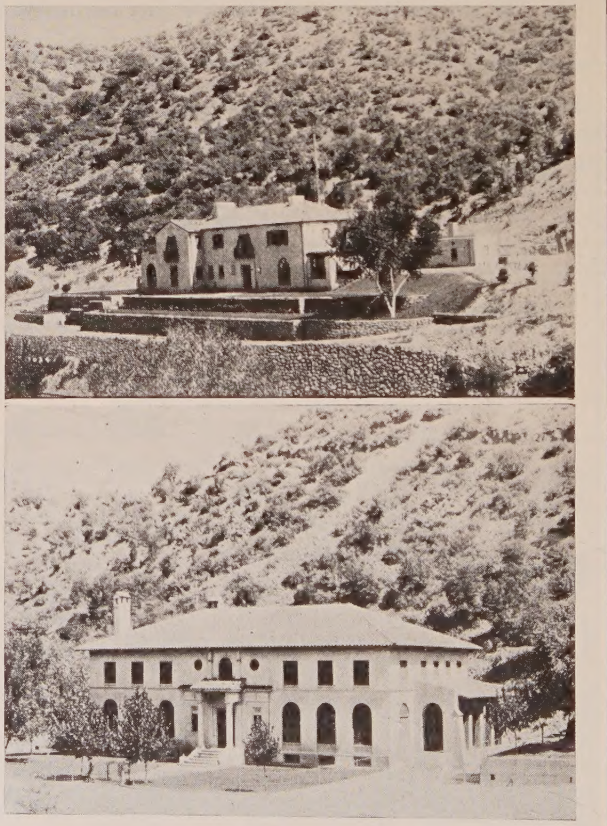
The two reinforced concrete buildings shown in the accompanying pictures, a dwelling and an office structure, are rather impressive—especially in their settings.

To find excellent examples of the modern Spanish type of architecture hidden away in the mountains of Arizona is interesting and unusual, but the Inspiration Copper Mining Co., Miami, Ariz., decided that simply because its mine was located away from the rest of the world was no reason for letting architectural ideals slip.

The visitor to the mine will find several fine buildings of reinforced concrete with 12-in. solid concrete walls. The general manager's residence fits admirably into the rugged mountain scenery and with the terraces held up by parapets of rubble masonry laid in concrete mortar makes a beautiful picture. The Administration building, while a little more symmetrical in design, carries out the general idea and adds appreciably to the general effect.

The architects in this project were Johnson, Kauffman & Coote, Los Angeles, Calif. The construction work was handled by the Walley Lumber Co., of Globe, Ariz.

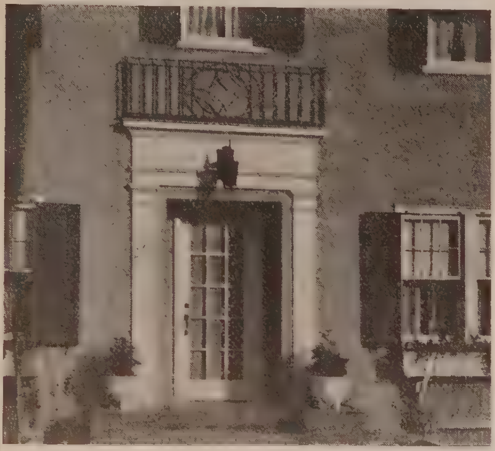
The "system" used in house building is less important than what goes into the mixer and then into the forms. The man behind the job is more important than any of his equipment.



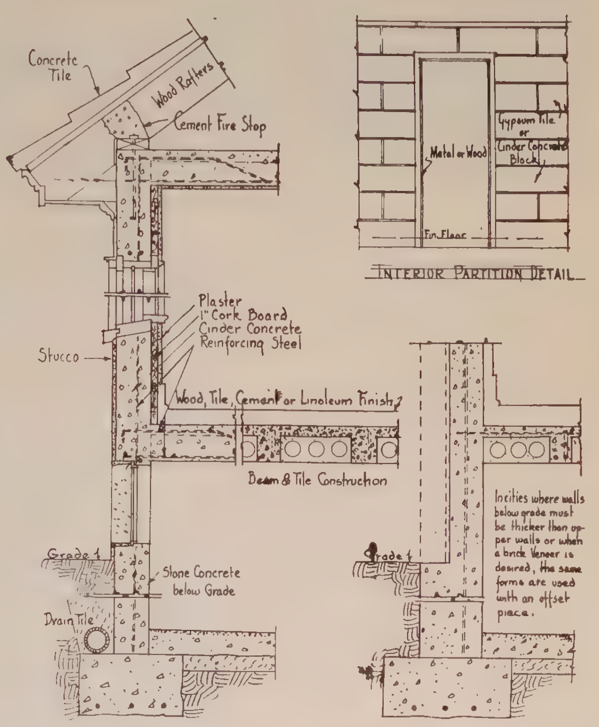
Above, General Manager's Residence; Below, Administration Building — Inspiration Copper Mining Co., Miami, Arizonia—Johnson, Kauffman and Coote, Architects, Los Angeles, Cal.

Significant Development of the Hueber Monolithic Houses at Syracuse

By A. J. R. Curtis



A Hueber Entrance


Concrete Tile
Wood Rafters
Cement Fire Stop
Plaster
1" Cork Board
Cinder Concrete
Reinforcing Steel
Stucco
Wood, Tile, Cement or Linoleum Finish
Beam & Tile Construction
Grade
Stone Concrete below Grade
Drain Tile
Metal or Wood
Gypsum Tile or Cinder Concrete Block
Fin. Floor
Interior Partition Detail
Grade
locities where walls below grade must be thicker than upper walls or when a brick Veneer is desired, the same forms are used with an offset piece.

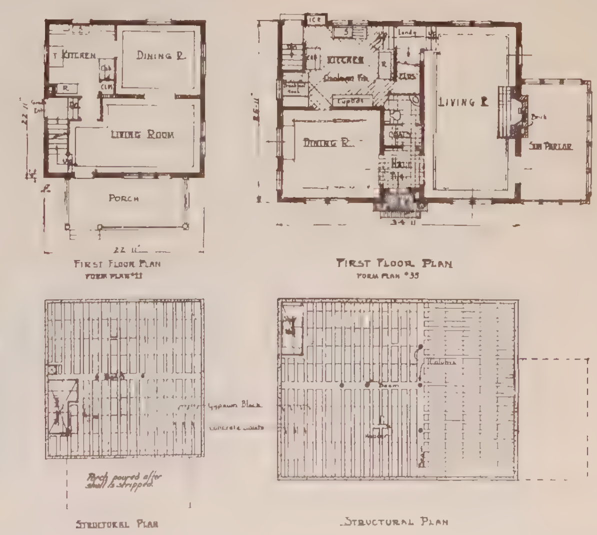


Fig. 2 (Above)—Hueber Details for Cinder Concrete Cork Lined Walls with Fireproof Floors

Fig. 3 (Below)—Hueber Floor Plans and Structural Plan for Floors

Two years ago, in the annual concrete house number of Concrete, the monolithic houses then being built by Hueber Brothers, contractors and builders at Syracuse, N. Y., were described and the general construction method explained and detailed. From the first, the Hueber operations have been characterized by the use of light sectional wooden forms, cinder concrete walls of thin section, concrete floors, fire-resistant partitions, ample wall insulation and above all, originality and versatility of architectural design. However, their development during the last two years has been so significant that an account of progress during that period will prove of unusual interest at this time.

It is significant to the visitor that almost every succeeding structure of the thirty or forty Hueber houses constructed to date, marks advancement of one kind or another. The very first house is years ahead of good masonry house construction as commonly practiced, it has a fine record for coal economy and architecturally it is a gem. Since it was built, the Hueber wall section has been reduced to a standard thickness of 6 inches of cinder concrete, reinforced. Insulation on exterior walls has been standardized, now consisting of a lining one inch thick of cork board or celotex. Interior non-bearing partitions are now constructed entirely of gypsum tile while in former practice some of these partitions were of metal lath on wood studding. Interior supports in addition to bearing walls consist of concrete filled wrought iron columns. Intricate or irregular shaped portions of the bearing walls, as under porches and gables, are constructed of concrete block. Forms have been simplified and more convenient concrete mixing and elevating machinery introduced.

Stucco surfaces have been used for the greater number of these houses but occasional buildings are surfaced with a veneer of face brick. Red brick chimneys have been used to provide contrast. Hard wall plaster is used, being applied directly and with equal success to the cork lining on exterior walls, concrete surfaces of interior bearing walls and the gypsum tile partitions. In the latest houses, metal interior trim and sash have been used.

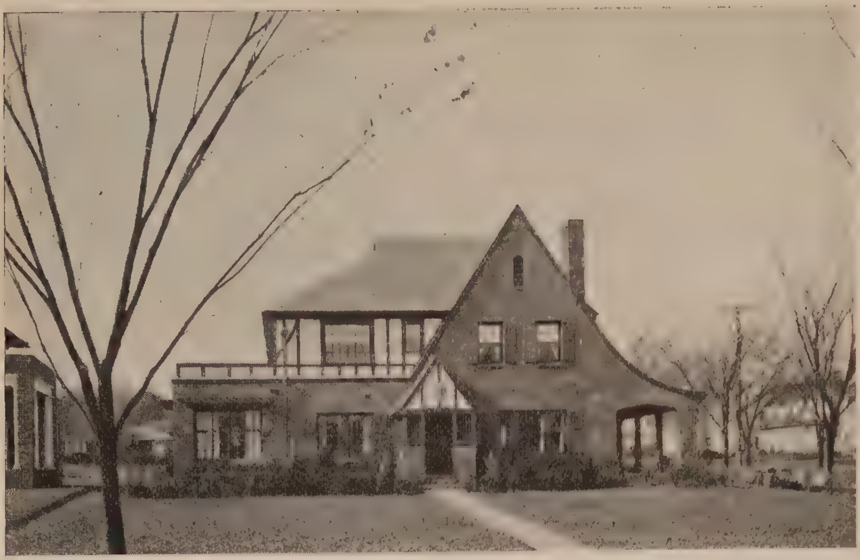


Fig. 4—The Huebers Finish Their Houses Outside as Their Public Wants Them—Inside the Shell is of Concrete—Floors and Walls

Fig. 5—The Hueber House under Construction

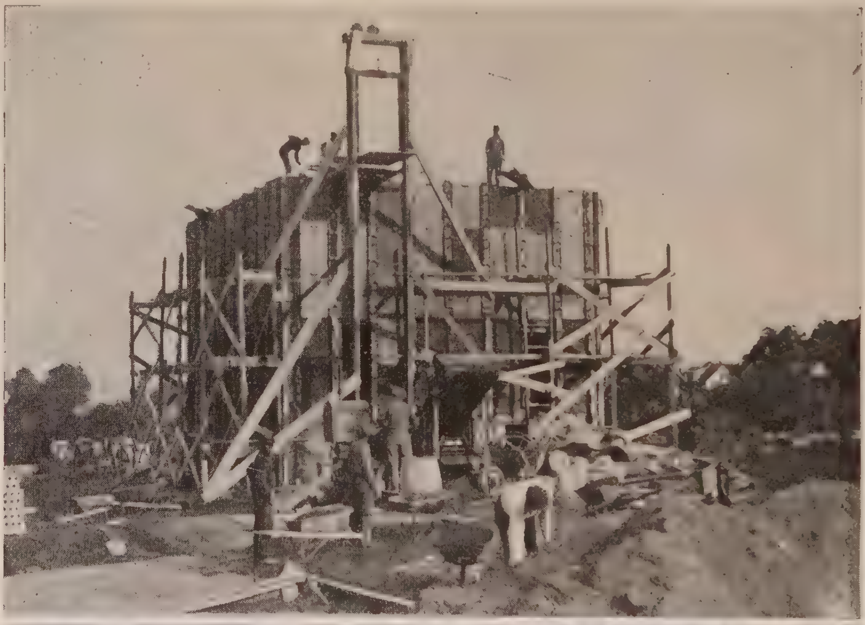
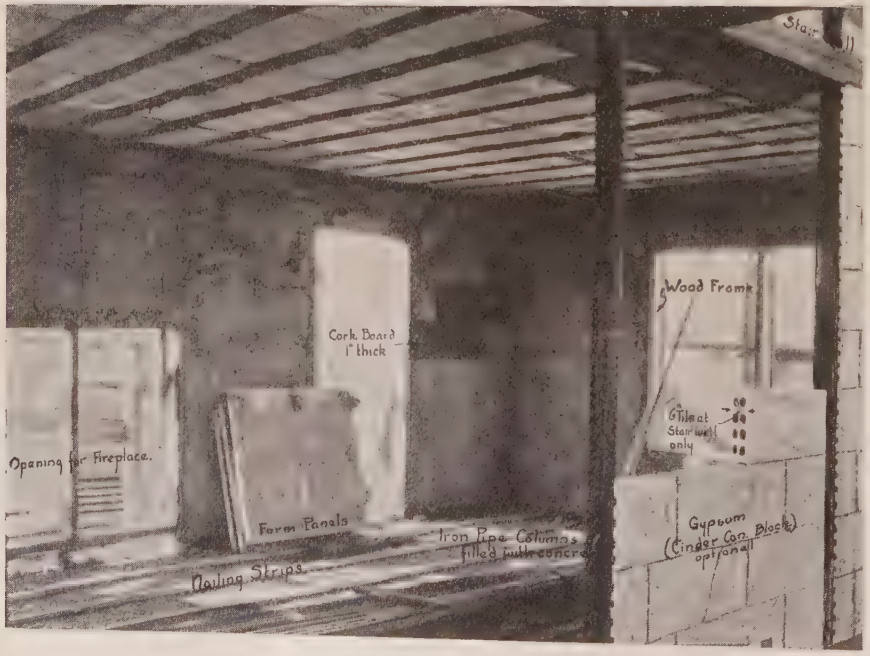


Fig. 6—This Shows What the Structural Parts of the House Are Made of and Something of How



Stair Wall
Wood Frame
Cork Board 1" thick
6" Tile at Stair well only
Opening for Fireplace.
Form Panels
Iron Pipe Columns filled with concr
Gypsum (Cinder Con. Block) optional
Nailing Strips

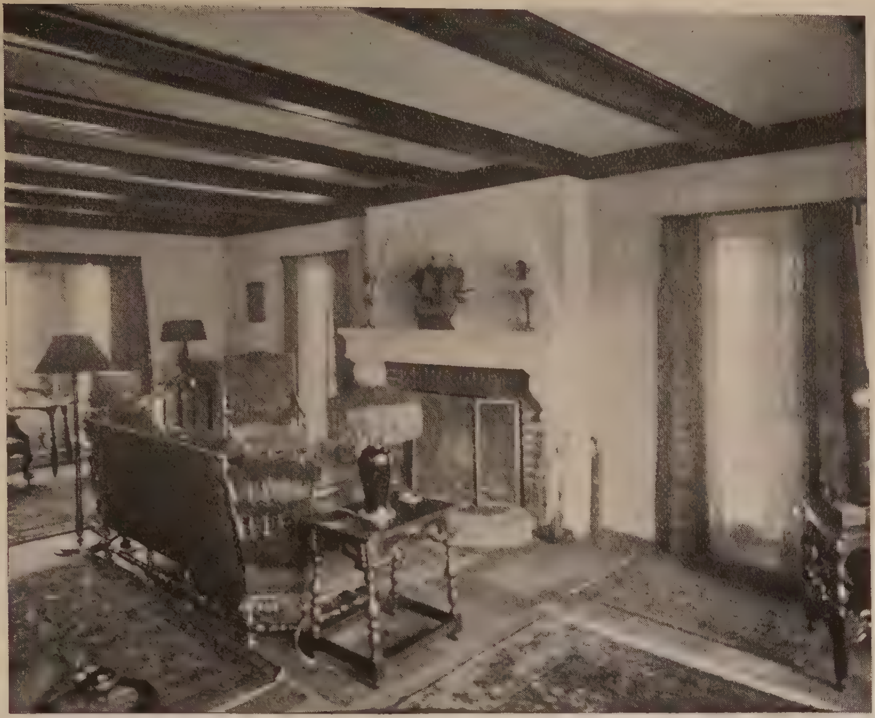


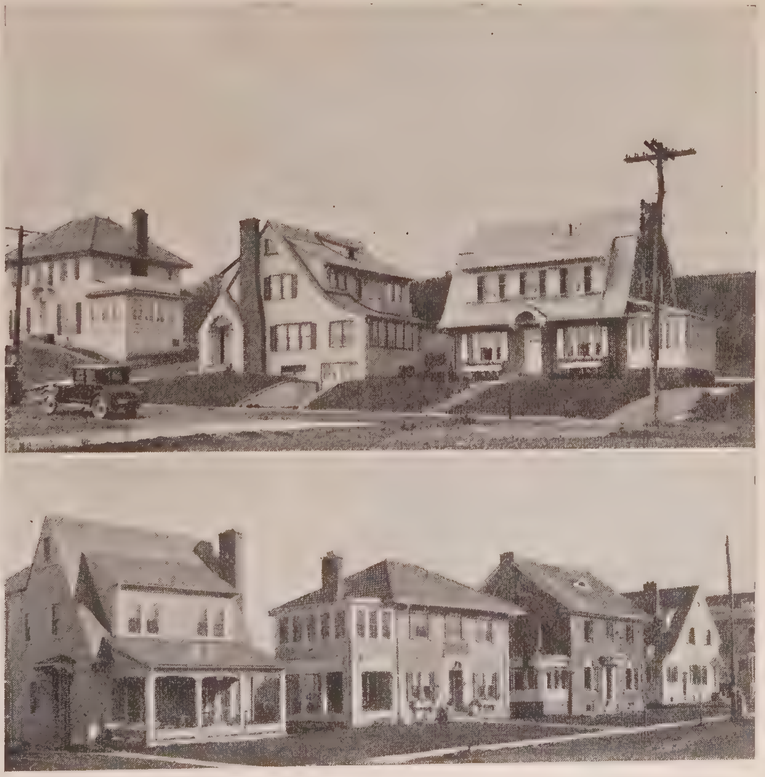
FIG. 7—THIS IS A HUEBER INTERIOR—THE LIVING ROOM OF THE REINFORCED CONCRETE HOUSE SHOWN IN FIG. 4

"THE FLOOR IS OF SLATE SLABS AND THEY COST A LITTLE LESS THAN A ⅞-IN. OAK FLOOR ON NAILING STRIPS," SAYS PAUL HUEBER. "THEY SURELY LOOK BEAUTIFUL AND THEY MADE A HIT. METAL TRIM USED COSTS ABOUT THE SAME AS WOOD, BUT UNLIKE WOOD IT DOES NOT SHRINK AND OPEN UP AT THE JOINTS, AND BEING SMALL, IT SAVES WORK IN CLEANING."

The method of placing the concrete floors has been standardized and very much simplified. As the concrete in the wall forms reaches a floor level, the flat floor form is placed, consisting of joist members produced from I beams, on which are carried standard wall form panels. Gypsum partition tile are placed on the floor forms on regular spacing, with open areas between in which are cast the reinforced floor beams. Floor reinforcing traversing both beams and slabs, is securely anchored in the bearing walls, being rigidly attached to the reinforcing in the latter.

Sand or stone aggregate concrete is used for the floor slabs in order to develop plenty of strength, at the same time cutting the effective depth of the slab to about 2 inches. The overall floor depth, counting depth of beam and plain surface finish is about 6 inches. Concrete floors in these houses are really delightful, combining every possible advantage. There is noticeably less dust carried upstairs from the cellar than in houses having the common type of "open" floor. The rigidity is a feature which users notice favorably. Variety of surface treatment provides artistic tone to

FIG. 8—SEVEN HUEBER HOUSES ARE SHOWN IN THESE PICTURES



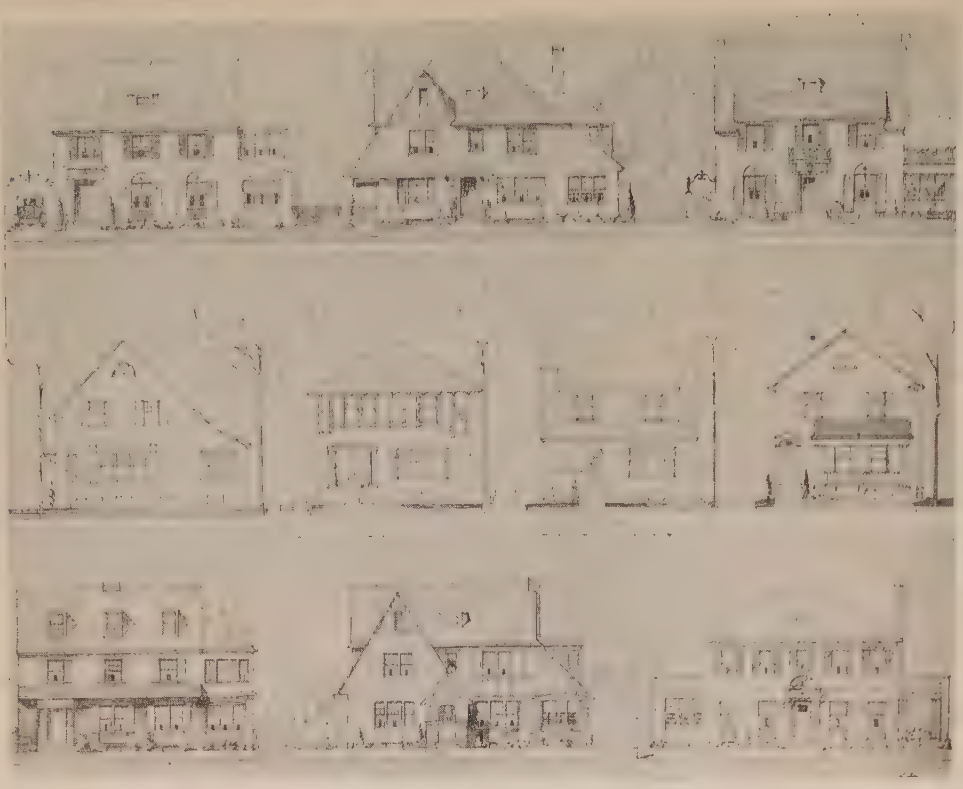


Fig. 9—Types of Hueber Elevations—Paul Hueber, Architect

the house and adds to serviceability. The main living rooms are often covered with hard wood; sun room, bath rooms and hallways with concrete tile; kitchen, pantry and service hallways with linoleum and bed rooms with smooth enameled concrete surfaces.

Reinforced concrete stairways are a pleasing and handy feature. A variety of treads have been used—hardwood, enameled concrete, floor tile and face brick. There is an unmistakable air of distinction about the masonry treads and their entire lack of resilience adds to ease and security when travelling up or down. Although face brick treads add a pleasing touch of color, as do face brick sills and other wall details, their irregularity provides an argument of some weight against their use.

Hueber Brothers' system of construction has been very much simplified by standardization of principal building dimensions. An accompanying illustration showing form size numbers 23 and 45, those commonly used in the Hueber houses, illustrate this point. It is of particular interest that although this method of construction permits easy variation of plans within wide limits, and the designer has been ambitious to present a pleasing variety of architectural effect and detail, popular demand has seemed to favor one or two general plans to the extent of eliminating others, for the present at least. Of course, the adoption of practically standard floor plans does not mean that elevations need be identical. Hueber ingenuity contrives to make every one quite different.

After looking over some fifteen or twenty of these houses, one is not at all surprised to hear the enthusiastic endorsement of the occupants. These are obviously good houses—good to look at and intelligently planned; more than that, they are good specimens of concrete engineering, absolutely fireproof and verminproof houses, perfectly insulated, and notwithstanding all of these idealistic qualities, all of them have been sold with a comfortable margin of profit to the builder. Those who are familiar with the development of monolithic house construction will see particular significance in that last statement. Where others have built large groups of monolithic houses and cleared a modest "wholesale" profit, few have been able to give purchasers of individual houses the many advantages of this type and at the same time earn reasonable compensation for themselves. As the public becomes acquainted with such buildings as these at Syracuse, we may expect concrete houses to begin selling at a premium.

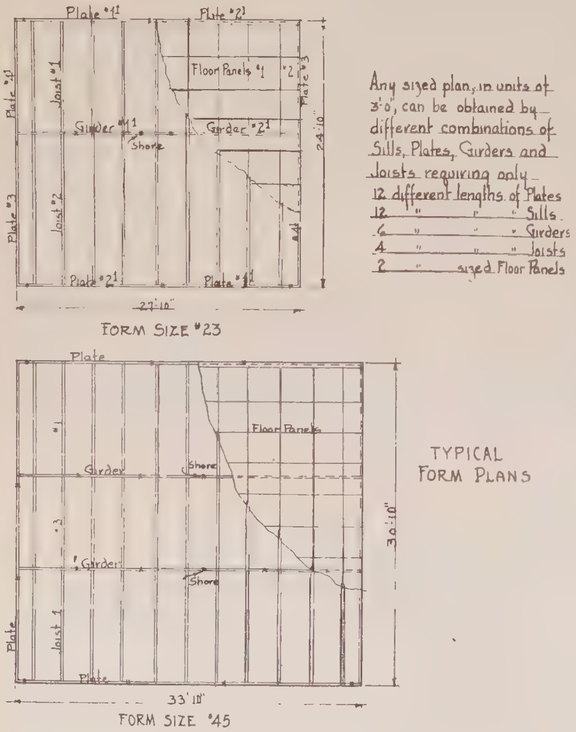


Fig. 10—This Shows a Typical Hueber Form Plan

Mr. Flagg Proposes Many Interesting Home Innovations and Puts His Faith in Concrete

By Harvey Whipple

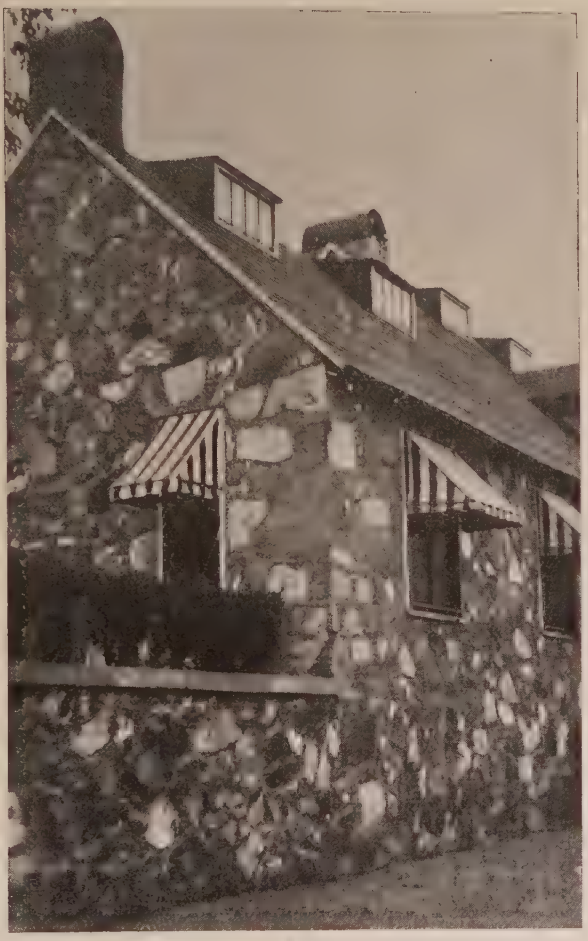


Fig. 1—Mr. Flagg's Stone Masonry is Plumped into Forms by Laborers and Backed up and Chinked up with Concrete

If you were to name your fingers after America's greatest architects, Ernest Flagg would probably find his place on the first hand. He designed the Singer Building and the Corcoran Art Gallery. These are recalled the more dramatically since he has turned his attention to small houses. Very few people would long remember the creator of a skyscraper or an art gallery though they were monuments. They might remember one who would deliver them from the bondage of domestic architectural tradition.

The public complaint is of recent recollection that good architecture and small houses were not on speaking terms. Good architects were too busy to fuss with the paltry fees of five to ten thousand dollar jobs.

That time has passed. Domestic architecture is now a matter of standardized family requirements, and the profit, as with Ford, is in production. Numerous agencies whose interest it is to awaken the homing instinct have put some of the best work of some of the best workmen into dollar books with complete working drawings for from five to twenty-five dollars. Lumber, brick and cement manufacturers buy the original work. The public gets it as cheap as a new tire for its flivver.

In architectural fundamentals, however, progress is recorded slowly.

But when a man of Mr. Flagg's special calibre turns his attention to the problem and proposes to lop a third off the cost of the average citizen's dwelling, *Collier's Weekly* tackles the thing with as much keen interest as a patent medicine fraud. Then we know that the small house problem is less a problem than it was. Not because its solution is achieved, but because it is fully recognized as a problem.

Thomas A. Edison set about solving the thing with

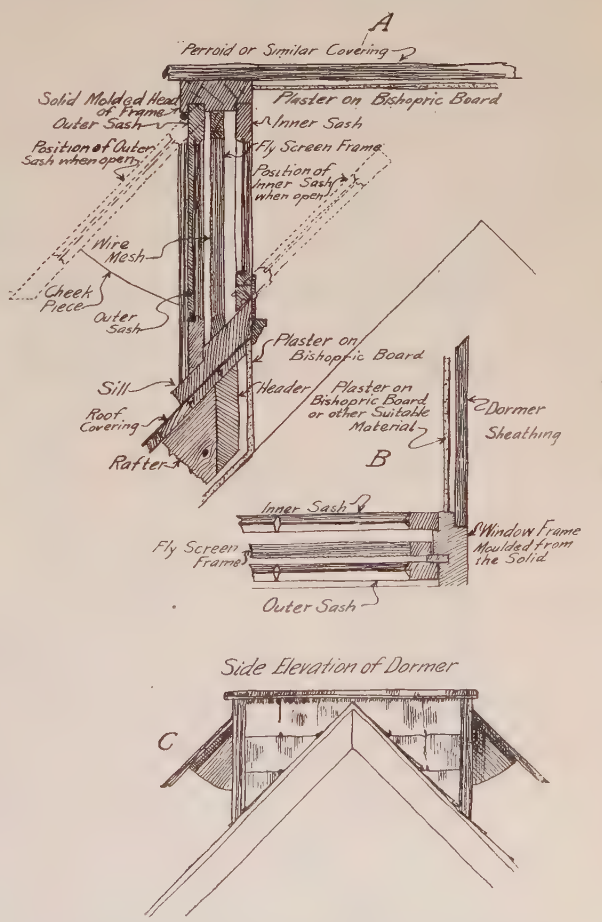

A
Perroid or Similar Covering
Solid Molded Head of Frame
Outer Sash
Position of Outer Sash when open
Wire Mesh
Cheek Piece
Outer Sash
Sill
Roof Covering
Rafter
Plaster on Bishopric Board
Inner Sash
Fly Screen Frame
Position of Inner Sash when open
Plaster on Bishopric Board
Header
Plaster on Bishopric Board or other Suitable Material
Dormer Sheathing
B
Inner Sash
Fly Screen Frame
Window Frame Moulded from the Solid
Outer Sash
Side Elevation of Dormer
C

Fig. 2—Reclaiming the Attic from its Oblivion of Dust and Moth Balls, Mr. Flagg Makes It Livable with Ridge Dormers—See Also Fig. 1. The Drawing is "after" Not by Flagg......

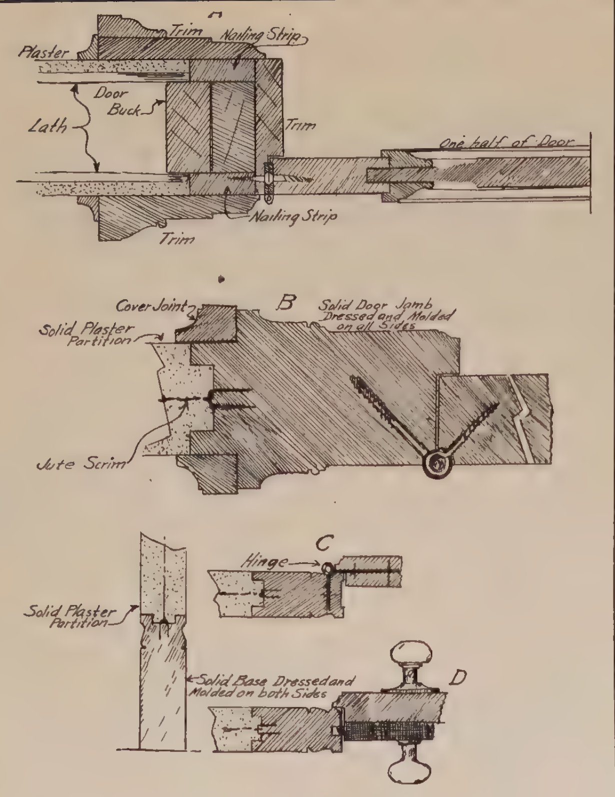


FIG. 3—AT THE TOP, A, YOU SEE HALF OF AN ORDINARY DOOR AND ITS JAMB, WHILE AT B IS MR. FLAGG'S SECTION TO SERVE THE SAME PURPOSE—BELOW AT C THE FRAMES, DOORS AND BASES IN LESS IMPORTANT PARTS OF THE HOUSE AND A HINT OF THE FLAGG PARTITION

concrete 15 years ago. He was distracted from his purpose before it was fulfilled. Besides, the time was not ripe, and Mr. Edison was not an architect. It was not cheapness that was wanted so much as relief from ugliness, and Mr. Edison's early models did not entirely achieve that relief. Now that building costs more—in terms of food, for instance—there is a demand for a good deal more. We must have beauty and—since we must spend more money—economy. Economy is wise expenditure. Wise expenditure is the kind that gives best returns. Again, now that building costs *more*, *better* building costs *less*, relatively. So we are turning more and more to masonry. Wood is so valuable it must be conserved for those uses which nothing else serves so well.

In all this we now have the architects striving to give us better houses for less money, than without their help we might thoughtlessly expend for purely ephemeral construction. Among these architects, who find in small houses a task worthy of all their art and skill is Ernest Flagg. He has been experimenting and studying and building small houses for years.

Mr. Flagg is enthusiastic about the solution of the small house problem. He shows his work at Dongan Hills, Staten Island, cheerfully. He is generous with his time, and sometimes plays tunes for his visitors on his very wonderful pipe organ.

In tackling the small house problem, Mr. Flagg tossed tradition out of the window. Some will say he did it unceremoniously—not to say roughly. You shall judge.

(1) He banishes the cellar.

(2) He eliminates, by appropriation, the attic, making it the second story clear up to the ridge board, using ridge dormers and ridge skylights (Fig. 2).

(3) His "ground floor" is truly *that*; it rests on the earth. (Fig. 1).

(4) His fireplaces have no sides—only a back and the fire, therefore, has full play, three ways. The throat is wide into a metal flue, which, of copper or bronze and exposed on the face of the masonry chimney, radiates a good deal of heat all the way and is made to serve an ornamental purpose as well.

(5) Moldings are all but eliminated as such, but the useful wood members have molded lines. Instance, the door buck is the door frame complete. (Fig. 3). "Why put in a rough piece of lumber and then cover it up with several finished pieces of lumber, when one

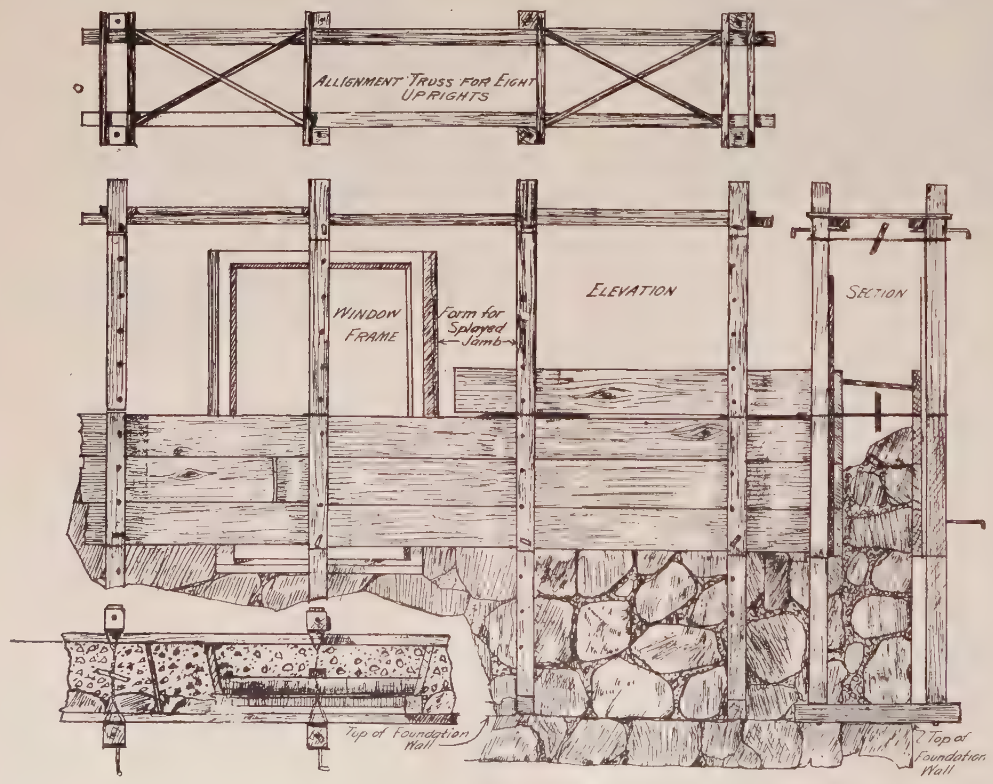


FIG. 4—THIS SHOWS HOW MR. FLAGG'S PATENTED FORM SYSTEM WORKS. IT IS EXPLAINED IN THE TEXT. THIS SKETCH IS REDRAWN FROM MR. FLAGG'S ORIGINAL IN HIS BOOK (CHARLES SCRIBNER'S SONS) "SMALL HOUSES." SEE ALSO FIG. 5

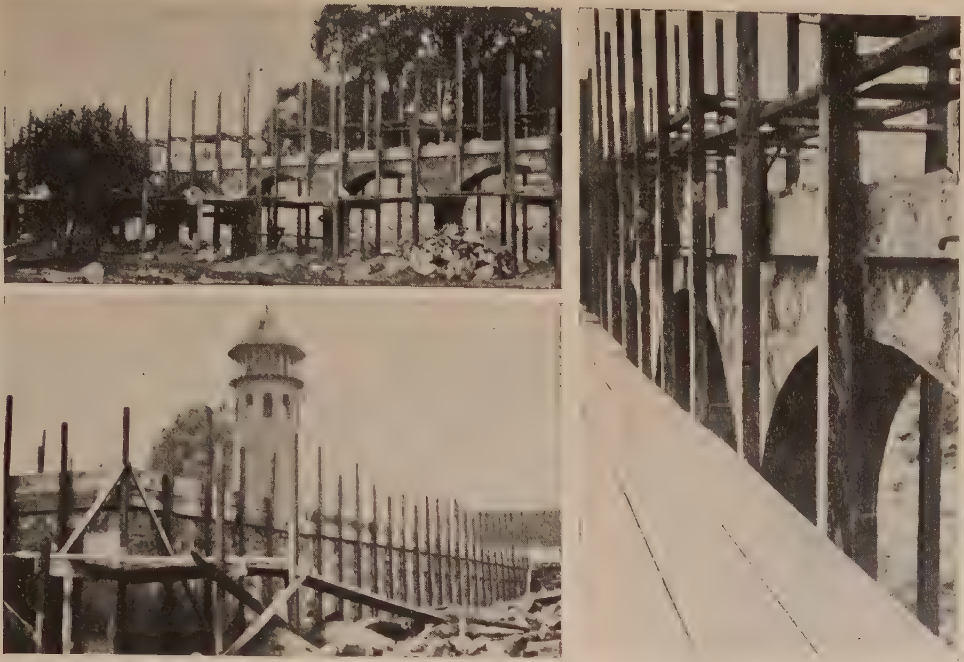


Fig. 5—The "System" in Use, Building a Large Shop Which is to be a Part of Flagg Small House Laboratory at Dongan Hills

finished piece serves the purpose?" Again, his beamed ceilings are what they seem—not three-board boxes tacked in place for ineffective deception.

(6) Heavy butt hinges are eliminated—excessive metal, difficult carpentry and being more than necessary, obtrusive. Flagg has a new patent hinge. (Fig. 3). The sketch shows an early model. The later model is stronger, but on the same principle.

(7) Ridge dormers make the roof space livable. (Fig. 2).

(8) The roof covering? Paper. Composition roofing (without the slate surface) in horizontal strips, laid shingle fashion—the nails (in precise rows, eaves to ridge) rusting, paint the roof into an effect of shingles. (Fig. 7).

(9) The thinnest of partitions—great economy of space. (Fig. 3).

(10) Elimination of gutters and down spouts.

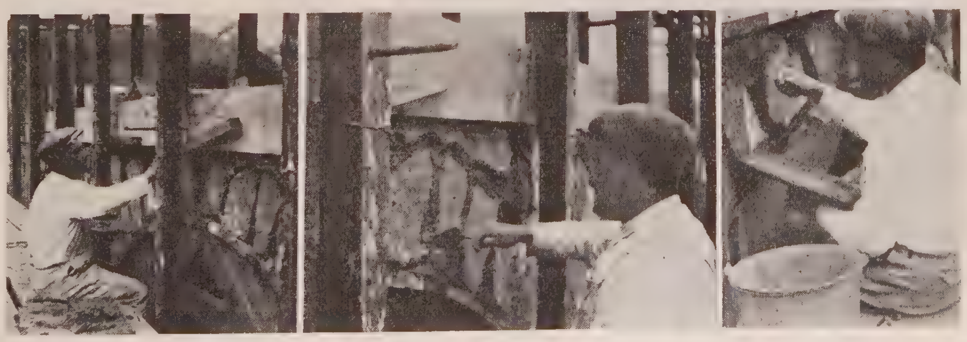
There are a number of other innovations, but the thing of most interest to the readers of Concrete, the walls. Those at Dongan Hills are faced with stone. (Fig. 1.) That happens to be a native touch—and a very satisfactory one for looks sake and because the stone is "on the place." A man's dwelling should, after all, be native as much as possible to its site. In observing this fundamental, concrete is a useful servant. Elsewhere, with no suitable stone at hand make a facing tile to line the forms, says Flagg. In any circumstance Mr. Flagg finds that concrete is the key. As to the surface it takes—that is a local detail; let it express what is available.

The "system"—Mr. Flagg too has a system of construction, as shown in Fig. 4; 4 x 4 uprights—as high as the masonry is to go—stand about 3 in. inside and outside the wall line 3 ft. 9 in. o. c. These are secured by alignment trusses (also see Fig. 5). Additional 4 x 4's support scaffold and runways. Holes at regular intervals through the 4 x 4 verticals admit L-shaped spikes or pins which secure the plank forms a tier or two at a time. Planks are tightened against the spreaders by wedges between planks and uprights. The work at Dongan Hills employs a stone which splits in straight seams. These flat sides are placed against the forms; little time is lost in fitting. Concrete from barrows is dumped in behind the stone. When a course is hard enough the pins are pried out easily; the wedges loosened and the planks lifted; then the wedges are tightened; pins driven; and so on up. As the forms move up, the stone face of the wall is revealed with wide chinks. (Fig. 6). A stiff mortar is made up with cement and sand—a little color perhaps if needed—and as much fine crushed stone (the same as the wall face) as can be crowded into the mix without making it unworkable. This coarse mud, brought in pails, is worked into the chinks by a workman with a small trowel. That is the Flagg wall.

What is left appears in Figs. 1 and 7.

Mr. Flagg's designs are in modules, a simple unit of measure; in this case 3 ft. 9 in., because two of these

Fig. 6—Filling the Chinks in the Rough Stone Work Which Faces the Concrete Walls. The Result, as Seen in Fig. 1 and at the Right in Fig. 5, is Very Pleasing



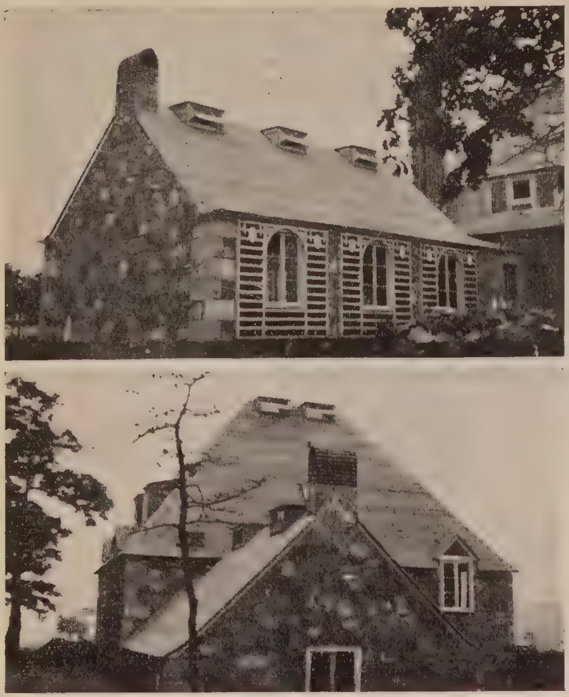


Fig. 7—Some Work by the Flagg System. Note Heavy Concrete Block Quoins and the Composition Roof in Strips, Shingle Fashion

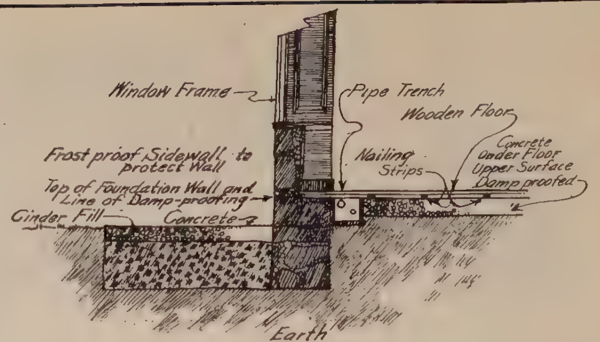

Window Frame
Pipe Trench
Wooden Floor
Frost proof Sidewall to protect Wall
Nailing Strips
Concrete Under Floor Upper Surface Damp proofed
Top of Foundation Wall and Line of Damp-proofing
Cinder Fill
Concrete
Earth

Fig. 8—Floor and Foundation Details

units are spanned by an 8 ft. stick; 3 by a 12 ft. piece; 4 by 16 ft.; and so on; and because automatically it makes for symmetry and ease of design.

It would be doing small justice to Mr. Flagg to pretend to cover his house building ideas in a few pages of this magazine when he has published a large book that tells all about it—from basic fundamentals to the last bit of detail. From this book (*Small Houses—Their Economic Design and Construction*, by Ernest Flagg, Architect, Charles Scribner's Sons, New York; price, $15.00), with Mr. Flagg's consent, we have redrawn some of his details. The pictures are from photographs made by Concrete at the scene of the work.

Cellarless houses are, of course, the usual thing in some regions. They may be expected, at most, to make slow progress in less balmy climates, even with Mr. Flagg's strong arguments and special construction (Fig. 8) in their favor. Ceilingless rooms that run away up to the peak of the roof like a chapel are becoming popular, especially for partially detached living rooms. The Flagg partitions, with a base of wire strands and jute bagging, were suggested by him and used years ahead of Mr. Flagg's present operations. These, and others of his ideas, are the products of his years of partial and more and more complete devotion to the small house problem. Now he has worked many factors into a composite contribution to that problem's solution. The significant thing is the reliance upon concrete. His form system is an evolution. With its present developed details it is comparatively new, and is offered here to students of that perennial question of the best means of fabricating the concrete house job.

Mr. Wilson Builds Fireproof Houses With New F. D. Lambie System

By Francis F. Wilson
Rockville Center, L. I.

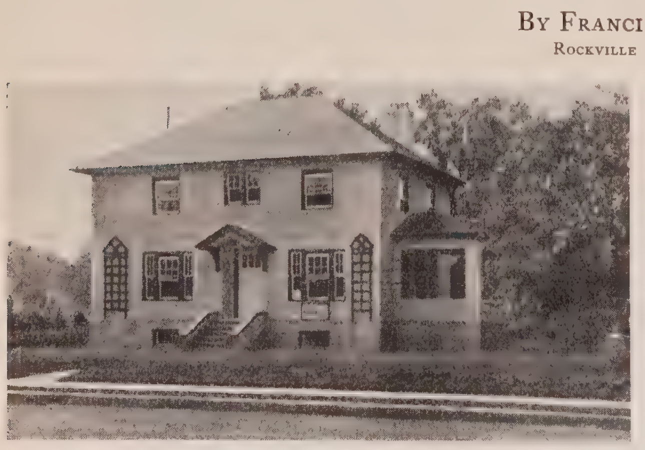
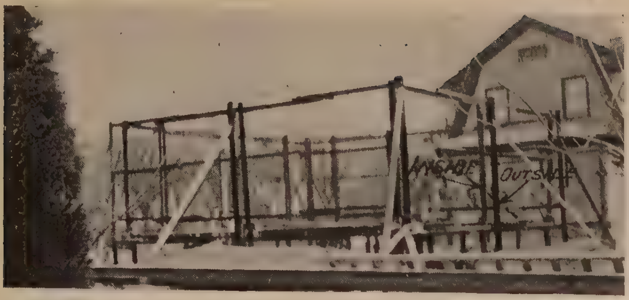
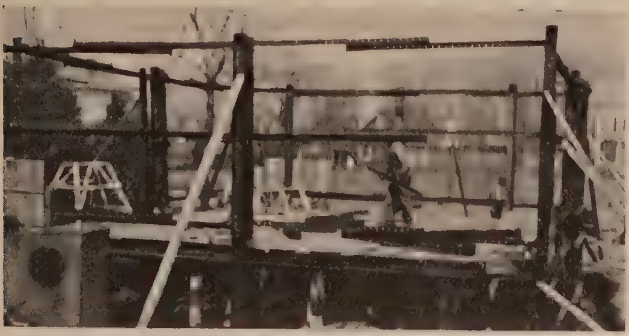


Fig. 1—Monolithic Concrete House Hydraulic System. Seven Rooms and Bath

Theodore Roosevelt once said: "Every man owes some of his time to the upbuilding of the profession to which he belongs." My aim is to build a home of reinforced concrete and to give it, within and without, character, thought and taste; to build it so that one would really live in it, not just occupy it; to build it so that the owner can feel it to be a refuge of comfort after the hard knocks of a busy day. That progress has been made along these lines to some degree, seems to be proved by the fact that owners are still living in homes I have built and sold, notwithstanding the pressure of advanced prices of all realty.

Some of the houses were erected using the old Lambie system, some using the Hydraulic system, both of which produced satisfactory buildings, although the immense tonnage of equipment, 35 tons in one case and 21 tons in the other, meant heavy handling and overhead costs. Desiring to build houses at a minimum cost without sacrificing quality, and to reduce the overhead, the systems the writer formerly used have been abandoned and the Frank D. Lambie steel skeleton system adopted. The accompanying illustrations show the system, the weight of the equipment for





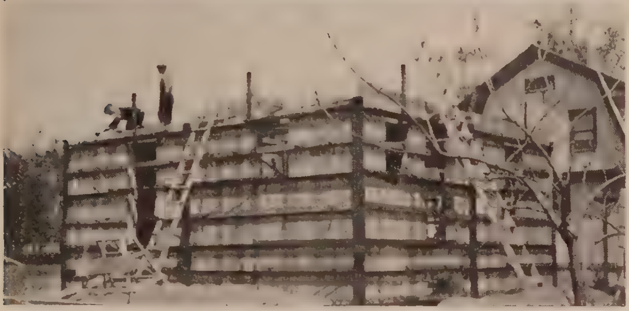


Fig. 2—Basement and First Story Nearly Ready for Lining

Fig. 3—Erecting Frank D. Lambie Steel Skeleton System

Fig. 4—Basement and First Story Ready to Pour

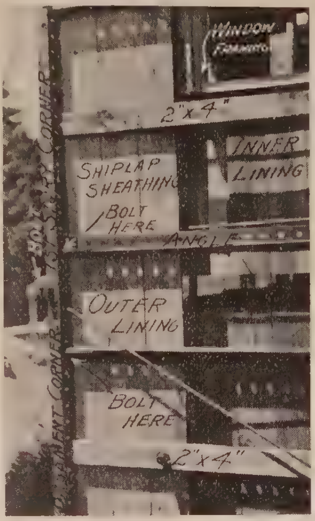
which is between 8 and 9 tons for a two-story house.

The new Lambie system consists of heavy angles inside and outside corners, lighter ones for liners and channels for intermediate posts, all punched with holes 3 in. apart allowing any measurements that are a multiple of 3 in. The erection is simple and speedy. The workmen grasp the idea very quickly and the resulting walls are true. Shiplap used first for lining is later used for sheathing the roofs. There is little waste, no more than when using the all-steel equipment.

In setting up for a house assumed lines for the inside and outside of walls are chalked on the footings. Outside members are set first, a corner angle being set at each corner of the house and a channel post midway between corners. Since the distance between corner and post for a house 24 ft. x 26 ft. is greater than the length of the liner angle, two liners are spliced to the correct length as shown in the illustration. There will be four rows, one above the other, clear around the building in each story height and when bolted together the skeleton of the outside of one story is ready for sheathing or lining. Between each pair of steel liners, a 2 x 4 is placed to tack the lining to and with this spacing, 1 x 8 in. shiplap makes good lining material.

The skeleton for the inner line of the wall is set up in a similar manner and the floor shoring set. Using this for a scaffold the next story skelteon is set by placing corner posts and channel posts on top of those already set, bolting them fast and bolting in another four rows of spliced liners as in the lower story. In this manner, the skeleton for 2 stories and basement is quickly set ready for lining. The lining for the outside of the wall should run from footings to the plate. When it has been properly fastened to the 2 x 4s windows and door frames are fastened to the lining where the openings are desired and reinforcing is placed. The inside lining is then placed in a like manner. When the floors are formed, the complete building is ready for placing the concrete which of course is done in one operation.

There is more demand, growing more and more insistent, for more homes of permanent construction and I know of nothing that will satisfy this demand like reinforced concrete. This does not refer to any of those schemes to build a house in a day or a story in 4 hours. Such schemes are for the industrial expert who merely wants a shelter for foreign workmen who have never lived in a house. The writer has in mind a home that is the birthright of every American citizen.



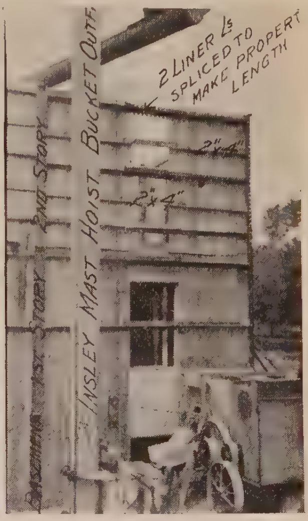

2 LINER Ls SPLICED TO MAKE PROPER LENGTH
2"x4"
2"x4"
INSLEY MAST HOIST BUCKET OUTF.
BASEMENT
1ST STORY
2ND STORY

Fig. 5—Construction View Showing Arrangement of Outer and Inner Linings

Fig. 6 (Right)—Second Story Ready to Pour

My houses sell in the same market and at the same price as frame houses of equal quality but being of permanent construction, the owner avoids the heavy tax for upkeep inherent to frame construction.

Only a rich man can afford a frame house, the poor man must have a home that will never wear out. His spare dollars will surely benefit his family more than if spent on painting and repairing.

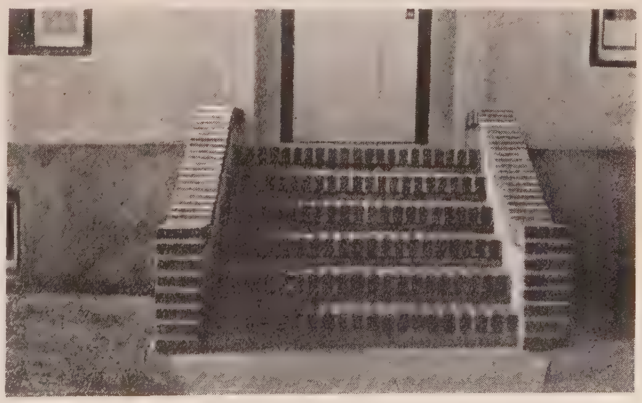


Fig. 7—Entrance Steps Monolithic Concrete Dwelling Shown in Fig. 1

Brick, tile and concrete block will also produce a permanent house, although those I have seen have wood floor beams. Since 90% of suburban fires originate within the house, such structures lack the fireproof feature. These unit system houses require masons and bricklayers who at the present time are doing much to increase the cost of building. One of the accompanying illustrations shows a monolithic house built with hydraulic forms. The entrance steps and rail are poured concrete and the brick was desired for color effect only. Only 256 brick were used and these and the sand and cement were piled alongside the concrete steps. It took two able bodied bricklayers and one helper nine hours each, to lay the 256 brick. The bricklayers got $1.87½ per hour and the helper 87½¢ per hour, a total of $41.63. It took 1 hour to lay 14 brick and cost 16¼¢ to lay one brick or 27 times the 1916 normal cost of ⅜¢ per brick. Therefore if one wants a home not a rattletrap, one built to stay, one that will save money on fire insurance fuel and fixings from year to year, a house of permanence and comfort without spending a mint of money on the first cost of his enterprise the answer must be monolithic reinforced concrete construction.

The Federal Internal Revenue Bureau says the life of a frame house is 20 to 25 years, a brick house 35 years, a stone or concrete house 50 to 100 years. All figures go to show that the monolithic house is at the same time better and cheaper.

The following parallel figures based on local data say the same thing in greater detail:

	Concrete walls, floors and stairs	Brick wood floor beams	Frame good construction
Sale price of house	$13500.00	$16000.00	$14000.00
Cash down	3500.00	6000.00	4000.00
First mortgage	6500.00	6500.00	6000.00
2nd mort. semi annual payments of $250.00	3500.00	3500.00	4000.00
ANNUAL CARRYING CHARGES			
Taxes	$ 160.00	$ 160.00	$ 160.00
Water rents	20.00	20.00	20.00
Gas	36.00	36.00	36.00
Electric light	24.00	24.00	24.00
Insurance	10.00	15.00	20.00
Upkeep	135.00	480.00	560.00
Interests and 2nd mtg. installments	1092.50	1092.50	1092.50
Carrying cost first year	1477.50	1827.50	1912.50
second year	1447.50	1797.50	1882.50
third year	1417.50	1767.50	1852.50
fourth year	1380.50	1737.50	1822.50
fifth year	1350.50	1707.50	1792.50
sixth year	1320.50	1677.50	1762.50
seventh year	1290.50	1647.50	1732.50
eighth year			1702.50
The second mtg. now being paid the buyer makes $500 semi annual payments on first mtg.	1760.00	2110.00	
	1700.00	2050.00	2165.00
tenth year	1640.00	1990.00	2105.00
eleventh year	1580.00	1930.00	2045.00
twelfth year	1520.00	1870.00	1985.00
thirteenth year	1460.00	1810.00	1925.00
House becomes free and clear 14th year	915.00	1265.00	1865.00
	$20259.50	$25187.50	$26550.00
Add initial cash down	3500.00	6000.00	4000.00
Total cost in 14 years	$23759.50	$31187.50	$30550.00
Deduct value of home now 14 yrs. old	11610.00	9600.00	6160.00
Net cost of shelter for 14 years	$12149.50	$21587.50	$24390.00
Average monthly cost of shelter	72.32	128.50	145.16

Each house has furnished the same shelter, but the brick house has cost 78% more to carry and is worth $2010.00 less than the concrete and the frame house cost 100% more to carry and is worth $5450.00 less than the concrete house. The permanent and enduring qualities of concrete make these great economies possible. The so-called cheap houses now being built only to sell, not to live in, are the most expensive to buy.

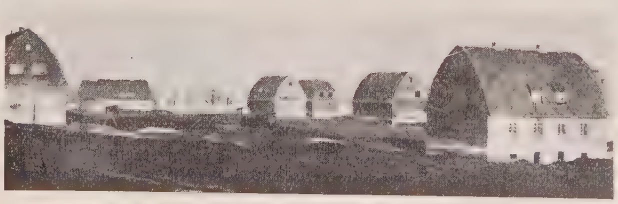


FIG. 1—SERIES OF HOUSES BUILT OF THE NONPLUS SYSTEM

A German System for Concrete Houses

A new method of house construction which is being used in Germany to simplify, as far as possible, building processes, as described in *Concrete and Constructional Engineering*, includes casting the walls in specially designed wooden molds, easily put together. The molds may be made in quantities in advance of construction work and in sizes and shapes to meet any requirements. The system has been applied to the construction of a large number of houses in several European countries.

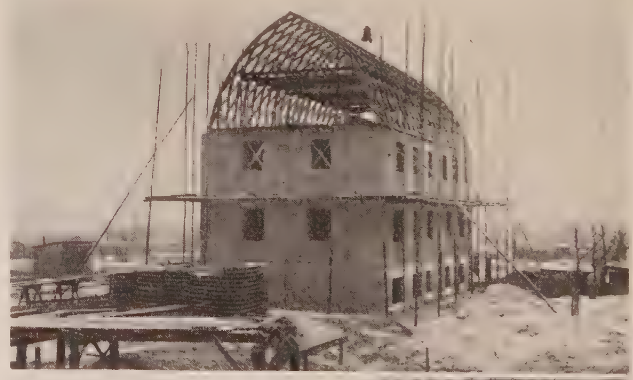
Special types of houses can be provided by using special sections of molds although practically any type of house can be built by adding or taking away some sections of the molds and their supports.

No nails or screws are used in erecting the molds or forms, the sections being held within their frame work by wooden cross bars turning on a pivot. The natural resiliency of the work and close fitting joints between the component parts are relied upon in assembling the forms and each mold can be used for the construction of at least 35 houses if kept in good repair.

Window sashes and door frames are fitted in to form a part of the mold with a view to the resulting saving in the cost of finally fitting the windows and doors.

An interesting feature of the particular house described is the built-up curved roof as shown in Fig. 2. The roof framing is built of a network of equal sized laths, made in advance, of uniform size and in any quantity, held together by means of bolts and nuts and where greater strength is needed, reinforcing vertical or diagonal laths may be added to the structure. The curved form gives added space.

Ten workmen are able to erect the molds for a one-story house in 6 or 7 hours and the molds can be dismantled by the same number of men in 4 or 5 hours.



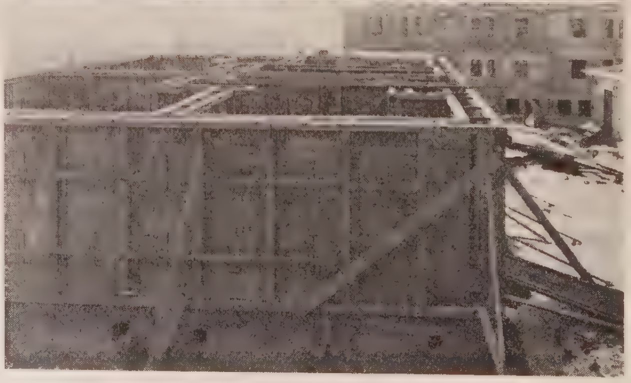


FIG. 2—A TYPICAL HOUSE WITH WALLS POURED AND SPECIAL CURVED ROOF FRAMING IN PLACE

FIG. 3—CLOSE UP VIEW SHOWING MOLDS IN PLACE FOR WALLS OF HOUSE

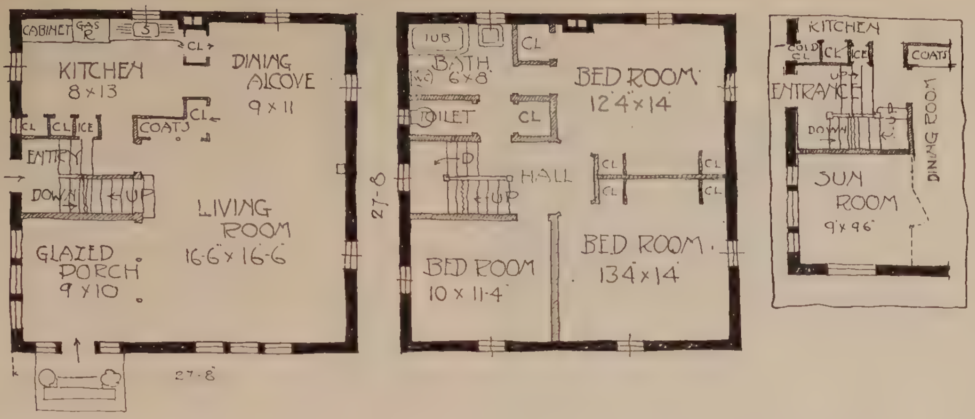


Fig. 2—(Left) Plan of Ground Floor. Note That Both the Dining Alcove and the Glazed Porch Form a Part of the Great Living Room. (Center) Plan of the Bed Room Floor. There Are Three Bedrooms Bath and an Extra Toilet. (Right) Changed Entrance Design. The Side Doorway Has Been Enlarged so as to Serve All Purposes. The Sun Room Takes the Place of the Entrance Porch

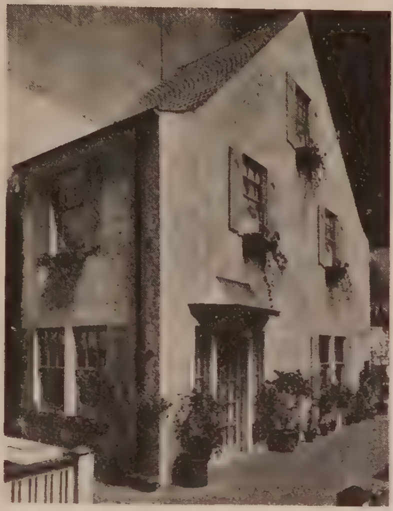


Fig. 1—The Side View of "The House That Bob and Betty Built." The Color Scheme Was Light Buff for the Stucco Walls. Copper Shingle Roof and Window Shutters, Paris Green

An Exposition House of Concrete

By Milton Dana Morrill

Architect

"If you expect to take your house down next week don't build it of concrete." This is the advice of the workmen who had to wreck the full size model house built on the floor of the last Own-Your-Home Exposition in New York.

We had built the house of concrete in order to demonstrate permanent construction for the home. Well! It did that all right, but also its permanency nearly swamped the man who had contracted to remove the house when the show was over.

The several committees who had charge of the design and building of this model house selected my plan as it seemed to them to be a compact small house suitable for the average family of moderate means. No one house plan can be made which will suit us all, but this small house is believed to be suitable to the general needs of many families, and as it has been standardized, it has some of the advantages of the thousand and one other standard made articles which we have in daily use.

Notwithstanding the battle which concrete as a house building material has had to face, it will in the near future become the standard construction for houses, just as it has become standard for dams, bridges, roads, sidewalks, factories and foundations. Modern methods make concrete the least expensive material to use where a house of masonry construction is desired.

In most parts of Europe, the building of frame houses is forbidden by law. Even if we never come to adopt such laws here, in the near future the prohibitive cost of lumber will in itself stop the building of frame houses.

Our Secretary of Agriculture tells us that we are now using up our house building lumber 8 times as fast as it is growing. Our forests in the eastern states have long since been cut off as have most of those in the lake region. Southern pine is becoming scarce and now we are drawing heavily on the West Coast forests.

Only a few years ago the concrete house built under favorable conditions cost 10% more than frame. Today it is a "toss-up" between the cost of concrete and wood. There may easily come a time within the next few years when the saving of the 10% in first cost as well as in upkeep and repair will be on the side of the concrete house.

Notwithstanding the prejudice which the concrete has had to meet, when well built it has proved its case as being the best house that money can buy.

But all this is aside from our subject—"The House That Bob and Betty Built," as this model home was called. The imaginary couple, Bob and Betty, were taken as the parents of a typical American family in moderate circumstances.

A glance at the floor plans will give an idea of the compact and convenient arrangement of the house

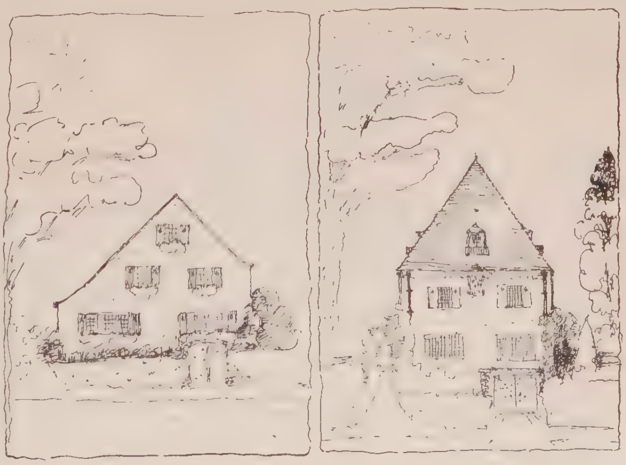
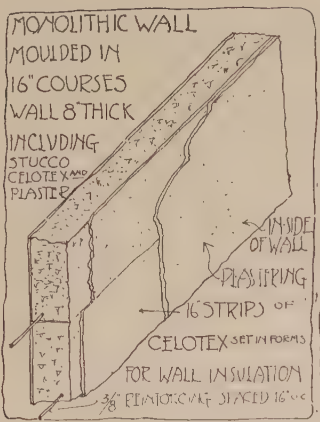
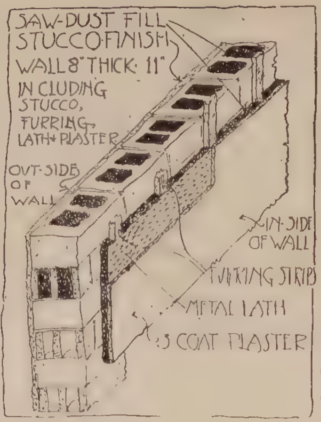


Fig. 3—First Alternate Design for the Exterior of the House. Note that in This Design the Glazed Porch is Extended Out Under the Low Roof. (Right) Second Alternate Design for the Exterior. In the Style of a French Cottage, with Vertical Lines Predominating





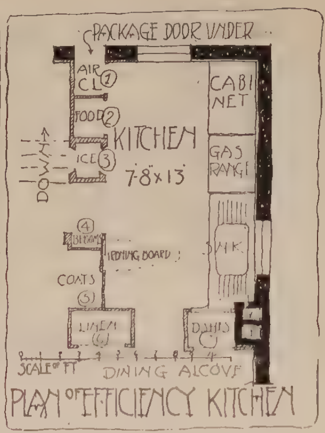


Fig. 4—Detail Of Monolithic Concrete Wall Showing Method of Insulation

Fig. 5—Detail of Concrete Block Wall Showing Hollow Cores of Blocks and Furring Spaces Filled with Sawdust for Insulation

Fig. 6—Detail Layout of the Kitchen. Especially Planned to Make Housework Easier

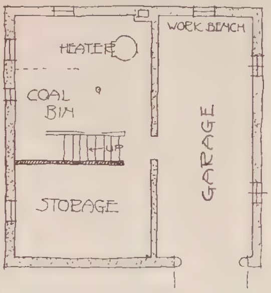
interior. Although the house is of small dimensions, the interior effect is large and roomy.

Easy house-keeping has been regarded as of prime importance in these days when domestic help is so scarce. For convenience as well as for low building costs, the house is made exactly square in plan. The glazed porch is planned for winter as well as for summer use. Three glass doors open into and make this a part of the living room. The dining alcove is also made a part of the living room to be closed off only by a screen when desired.

As one enters, there is a coat closet just at the foot of the stairs. This closet, as well as all the others in the house, is fitted with rod and coat hangers planned both to save space and to keep garments in proper condition.

The kitchen is arranged to save space and reduce work. The side door on grade level gives entrance to the basement as well.

Instead of the usual partitions enclosing the kitchen, shallow closets serve this purpose and place everything within easy reach of the cook. There is a service door where the milk, morning paper and packages can be left out of sight. A cold air food closet obviates the use of ice except in the hottest months. The dish closets adjoin the sink and at the same time open directly into the dining alcove in order to save steps in setting the table. There are several other small closets for such things as table and kitchen linen, brooms, vacuum cleaner etc. The attic space is protected by insulation from heat and cold, and is used as a study and in part as a small bedroom.



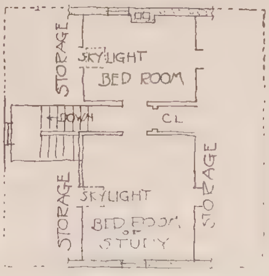


Fig. 7—Plan of the Basement Serving in Part as a Garage as Well as for Storage and Heating Plant

Fig. 8—(Right) Plan of Attic Story. The Ceiling Here is Insulated Against the Heat as Well as the Cold. Space is Found Here for a Small Study and a Small Bed Room

In the basement where it will never freeze, the garage is built in with fireproof doors and concrete walls and floor slab over.

The specifications for this house call for either 8-in walls built of concrete blocks, stuccoed outside and furred out for lath and plaster inside, or for 6½-in. monolithic walls molded with a celotex lining, which is set into the forms each 16 in. in height as concrete is poured. The monolithic walls call for a one coat stucco finish on the outside. The plastering on the inside is applied directly to the celotex wall lining.

For the concrete block wall, the hollow spaces in the blocks are to be filled in with saw dust as the wall is built, and the space between the wood furring strips which are attached to the inside of the walls is also to be filled in with sawdust back of the metal lath and before the plaster is applied. This is done in order to break up air circulation and to make these dead air spaces. The porous celotex serves the same purpose for the monolithic walls.

In order to give some choice in exterior appearance, several different exterior designs have been made which can be used with the same standard house plan. Slight variations in the interior can be made without changing the general plan, as in the detail plan showing the front entrance omitted and the side entrance enlarged so as to serve for both the front and the back door.

The estimates which have been obtained show that this house can be built in the New York section for $7,000 to $10,000, depending upon the grade of finish desired. In most locations the cost would be somewhat less than this figure.

In order to be of service to any reader of Concrete who may wish to build this model house, an arrangement has been made whereby the complete working plans and specifications are available. For each house so built the architect's fee is $25.00.

Proposed Standard Recommended Practice for the Design and Construction of Concrete Dwelling Houses will be presented at the Institute Convention in Chicago, Feb. 25-28, and should be important in giving a recognized status for the work of concrete house builders.

Fig. 1—Side View of the Engineer's Cottage Showing the Molded Mortar Roof Covering

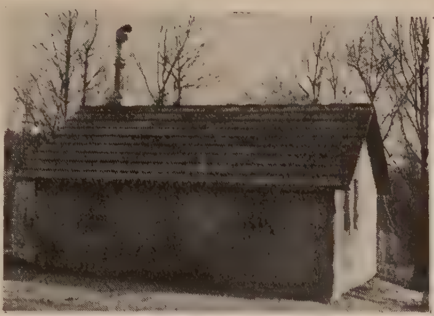


Fig. 2—Entrance End (Engineer's Lodge)

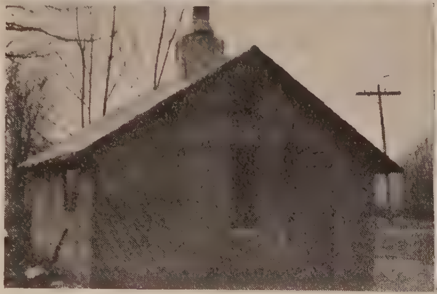
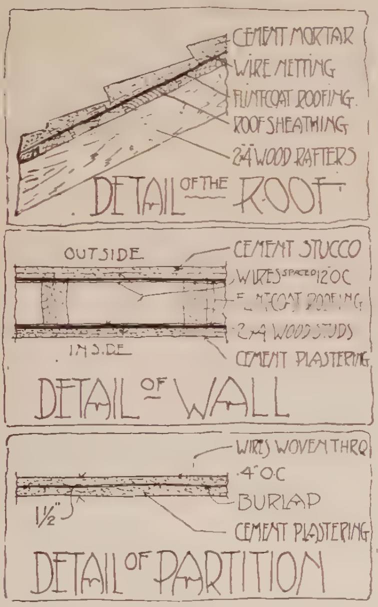


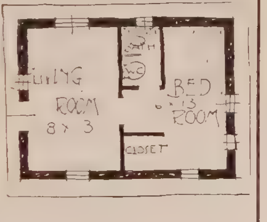
Fig. 3—The Ship's Lantern and Its Wrought Iron Bracket (Engineer's Lodge)

Engineer's Lodge Built From Materials Found at Hand

In these days of modern transportation, how often we overlook superior building materials which lie at our very feet and build with inferior materials which have to be hauled thousands of miles!

A cottage built on a timber lot in New Hampshire, within a stone's throw of spruce, pine and hemlock is often found to be built of North Carolina pine. If we look further, we find that the freight on this lumber costs more than the lumber itself.





Figs. 4 and 5—Details of Construction, Showing New Use of Composition Roofing as a Base for Cement Mortar, and the Plan of the Engineer's Cottage

Using materials found at hand is perhaps one of the "secrets" of reducing the present high cost of building.

Locally found building materials are often more fitting, as well as saving in freight.

What is more beautiful than a log cabin if built in a forest, or a house of field stone if built in the stone wall country of New England!

The tiny cottage here shown teaches us a valuable lesson in the art of building from the materials found close at hand.

William L. Searles, who largely with his own hands designed and built this house, is by profession neither an architect nor a builder. In ability he is much of both.

Perhaps he did not know, as a builder would, that fir which has to be hauled 5000 miles from the state of Oregon is the usual material to be used in this section of the country for the building of such a cottage.

Perhaps he just looked around near the site for building material, and, seeing the gravel bank within a stone's throw, decided that concrete was the natural construction to use.

This tiny cottage is owned by the Water Co. of Tokeneke, which is near Darien, Conn. While in its small dimensions, 14 ft. x 18 ft. 8 in., it would hardly be suitable for a large family, it makes a cozy lodge for A. A. Austin, who lives there by himself. The inside of the cottage is in reality one great room. The partitions which divide it are only 6 ft. high, so that one stove heats the whole house, including living room, bedroom and the bathroom.

The construction is unique. The outside walls were built as follows: The frame of 2 x 4 wooden studs was first made, the studs being set 12 in. o. c. Tacked to the studs, horizontally every 12 in. in height, wires were strung. Over these wires, flint-coat roofing was nailed to the studs. Outside this layer of roofing another network of wires was applied. The whole was then covered with cement stucco, left with the trowel marks showing.

Mr. Searles applied to this stucco a tinted cement coating, the prevailing tone of which is golden yellow. It is not, however, of even color. In some places browns and reds have been blended in, so that the whole effect is soft and pleasing. The outside planting around the house will still further enhance the beauty of the cottage.

The inner side of the house walls was built and finished in the same way as the exterior, except that mortar was rubbed to a sand finish and then painted.

The partitions within the house were made by weaving wires each 4 in. through burlap, which was stretched into position to form a mesh and background for the cement mortar. While the first coat was being applied, it was necessary for one man to hold a light board against the burlap while the plasterer coated the opposite side of the partition. When the first coat was on and had hardened, the partition became rigid, so that the other coats were applied without backing up. The finished partitions are 1½ in. thick.

The roof of the cottage was built in much the same way as the side walls. Over the rafters sheathing boards were laid, which boards form the ceiling, being exposed on the under side. Over the roof sheathing, flint-coat roofing was applied. Over the roofing a layer of wire netting was spread and secured. The finished mortar coat was then applied to the roof; this mortar was put on in shingle-shaped courses. The butts of these courses ran 1½ in. thick and tapered to ¾ in. These courses of mortar were then cut with a knife every 6 in. to 8 in., so as to represent shingles or tiles.

At the eaves, the netting was turned back and tacked against the house, thus forming ground for the soffit, which is of mortar also.

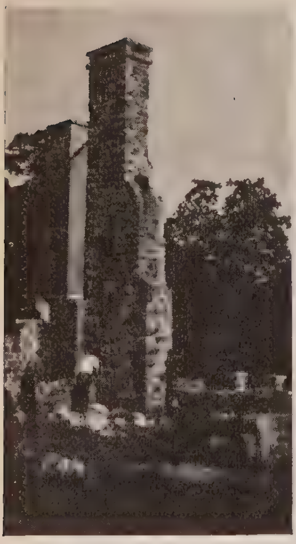
This makes a good looking roof and offers possibilities for various types of finishes. For example, if coarse yellow sand was pressed into the surface of the mortar tiles while green, it would give a rough and artistic finish, and any variety of color could be gained by changing or mixing different colored sands.

Apparently the cement mortar adheres well to the rough surface of the flint-coat roofing. Whether this bond will continue permanently time only can tell. If this should prove to be the case, cement mortar will then qualify for a new use in giving added permanence to what many consider a more or less temporary type of roofing.

"The Burnt Child Dreads the Fire"

Heeding a Lesson Taught by Fire, Mr. Dana Wisely Selects Concrete to Replace Wood in Rebuilding His Home

By Milton Dana Morrill
Architect



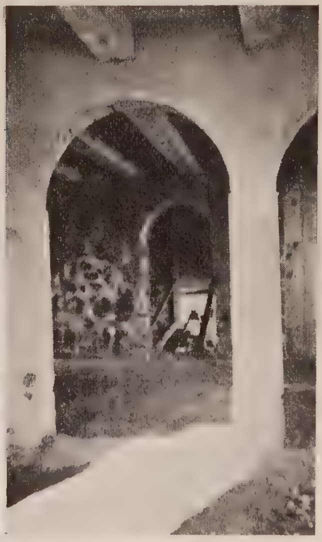


Fig. 1—Removing the Chimneys, All that Was Left of the Wooden House 20 Minutes after the Fire Was Discovered. All the Broken Brick and Stone from These Chimneys Was Grouted into the Concrete in Molding the Walls of the New House

Fig. 2 (Right)—Archways Which Divide the Dining Room from the Drawing Room. The Exposed Beamed Ceiling and Other Concrete Show How Another Fire Would Be Avoided

On the crest of a stony ridge in Southern Connecticut and not far from the shore of Long Island Sound stands the rough shell of what will be a house of more than usual interest. Tokeneke is the name of this section of the shore which lies to the south and not far from Darien.

The owner of this interesting new house is Mr. Charles Bates Dana of the law firm of Dorman & Dana, 32 Liberty St., New York.

The problem which Mr. Dana had to face was not just the building of a new house, but the rebuilding of one which had been burned. The use of the substantial masonry foundations which were left by the fire, determined, more or less, the house plan.

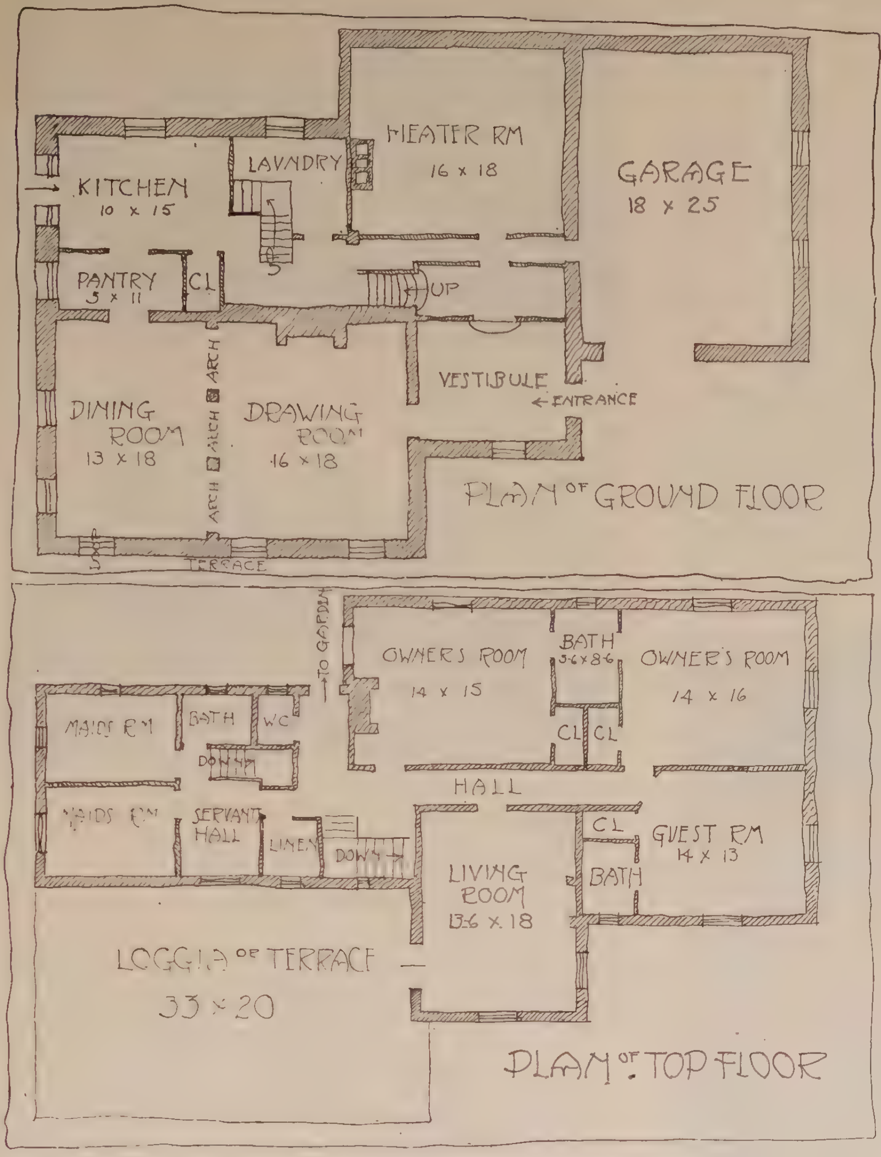
Mr. Dana, in his new house, was resolved to avoid as far as possible inflammable construction. This resolve was quite natural as it resulted from bitter experience. From their wooden house they had been driven out by fire at three o'clock in the morning, dressed in night clothing, leaving behind them to burn a choice collection of antiques, the heirlooms of three generations, as well as the thousand and one personal effects, which no money can replace. Under such circumstances it is not strange that to this family the fire danger had become real and was to be avoided by the use of fire proof materials.

Mr. Dana worked out the unique plan for his house largely by himself. Daunted on one side by the high cost of living, on another side by the high cost of building, he has achieved interesting results, and the limitations which seemed at the time as obstacles have been turned to account. These limitations have shaped a house design which is not of a usual type.

What was the high basement of the old house has now become the ground floor of the new house and space which had served only for wood storage has now become the drawing and the dining rooms. The space which in the old house served as chauffeurs quarters now serves as the main entrance. This basement space could be made use of as on the hillside it was above grade.

In order to get an idea of how the house would appear when rebuilt, Mr. Dana made a small model of it beforehand. A raspberry box was made to serve as the core of this tiny model. The rafters were formed of matches. The walls and roof were molded of tinted plasticine. The model was simple to make, yet it gave a much clearer idea of the proposed house than would be possible to get from elaborate drawings. From such a model a view can be had from every angle, from points near and far away, and from high and low down, just as the house now appears high above the roadway.

Owing to its location on the high ridge, a breeze prevails whichever way the wind blows. "Del Vento" is the fitting name which has been given, "The Winds" if we say it in plain English.



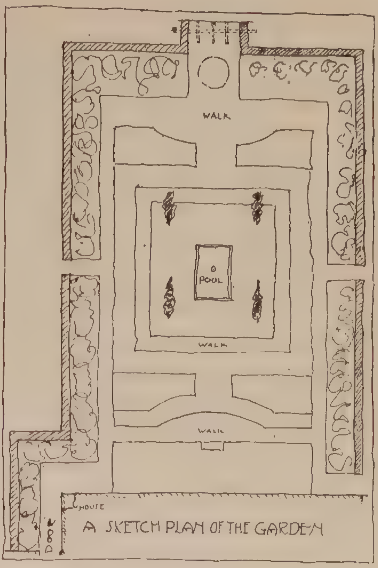


Fig. 3—Plan of Ground Floor and Plan of Top Floor

Fig. 4—A Sketch Plan of the Garden

The style of architecture which has been chosen is particularly happy. An Italian farm house has been taken as the prototype. Simple and low in general line, the house nestles in and upon the rocks of the ridge. Gray portland cement stucco has been chosen as the exterior finish, which is to be applied to the rough molded walls so that the house, the color of the rocks, will appear as a part of the natural setting. As the house walls were molded in steel forms[1], leaving them smooth and straight, a single coat of stucco ¼ in. thick is all that is required to give the exterior finish. After this thin coat is applied care is taken not to work over or iron out with trowel, as this is likely to break the bond which the mortar gets as it is applied. This is the "secret" of this one-coat stucco finish which has been successfully used over molded walls.

Wesley Grant Wood was chosen as the builder on account of his long experience in the building of molded concrete houses. To the readers of Concrete his work is already known.

In the design and building of his home, Mr. Dana has been fortunate in gaining the cooperation of his neighbors. Mrs. F. Raymond Holland, whose attractive concrete house is near by, has contributed valuable ideas as has also William L. Searles, whose interesting work in concrete we hope to make the subject of a later article. Both Mrs. Holland and Mr. Searles have spent much of their time in Italy in travel, so that the great charm of the Italian cottages overlooking the sea will be reflected in this terraced house on the Connecticut ridge.

The concrete walls of the Dana house are 8 in. thick. The mixture was proportioned, 3 parts sand and 4 parts

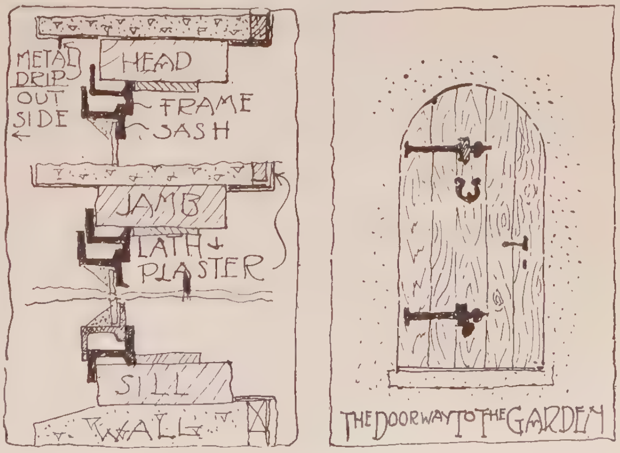


Fig. 5—Detail of Windows. The Doorway to the Garden

stone to one part cement. As the concrete was placed in the forms, chunks of the brick and stone masonry left from the walls and chimneys were grouted in the wet concrete; thus this waste material was disposed of and at the same time utilized in the reconstruction.

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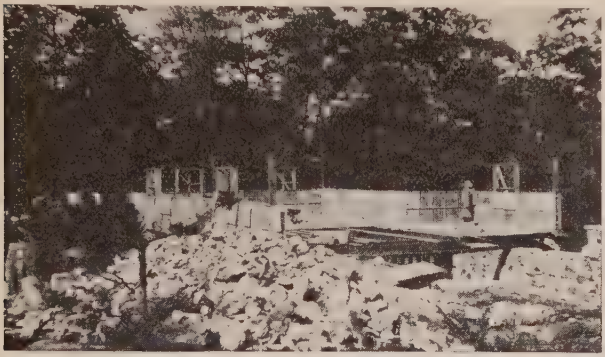
[1] The Morrill System, M. D. Morrill, South Norwalk, Conn.

The house walls were lightly reinforced by placing $\frac{3}{8}$-in. steel rods, forming belts around the house each 2 ft. in height. Over and under each wall opening, such as windows and doors, two additional short rods were placed.

The exterior walls are furred out so as to form an air space between the concrete and the lath and plaster. The interior plaster is applied throughout over metal lath as an additional fire protection. In the windows[2], both frame and sash are of steel. These are of the casement type. The usual inside wood trim will be omitted, the plaster being returned at the frames forming a jamb. The only woodwork at the windows is the plank frame which was set in place as the walls were molded.

The drawing room and dining room have fireproof floors and ceilings. The latter is finished with the concrete beams left exposed. These beams were made square in section and spaced about 24 in. apart. The bottoms of these exposed beams will be decorated by a stencil pattern. This beamed ceiling also forms the floor of the open terrace above. The floor slab which was formed with the beams is $2\frac{1}{2}$ in. thick. The pitch to form necessary slope to the terrace floor was made by a graded cinder concrete fill laid over the slab. In order to avoid the danger of condensation on the ceiling below this open terrace, sheets of Celotex $\frac{1}{2}$ in. thick were laid in a bed of hot tar over the cinder fill, then a 4-ply felt and tar roof was applied. Over this, concrete tiles will be formed as a finished terrace floor. This tiling will be made by first laying thin strips of wood set on edge and dividing the floor up into squares 9 in. x 9 in. The floor will then be leveled up to the top of the wood strips with concrete, gray in color. The thin wood strips will then be removed leaving the open joints between the tiles. These open joints will be later filled in with black cement mortar.



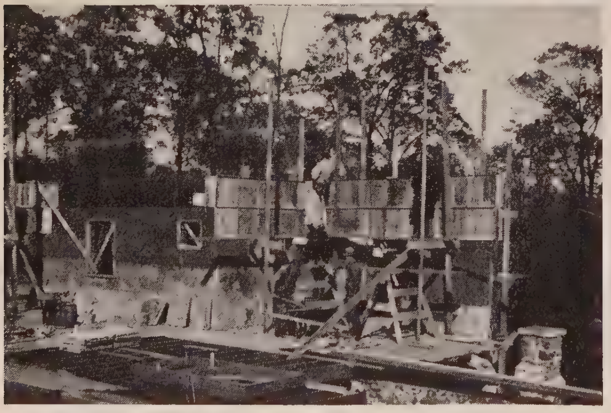
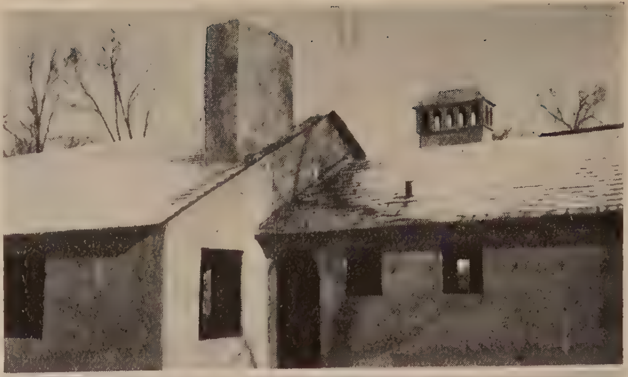


FIG. 6—THE OLD WORK DEMOLISHED AND THE STEEL FORMS SET FOR THE FIRST TWO COURSES OF THE HOUSE WALL. PLANK FRAMES SET FOR THE FIRST TWO COURSES OF THE HOUSE WALL. PLANK FRAMES ARE SET IN BETWEEN THE FORMS TO MAKE THE DOORS AND WINDOWS

FIG. 7—AN INSIDE VIEW SHOWING THE FILLING OF THE GABLE WALLS. THE CONCRETE WAS WHEELED FROM THE MIXER AND PASSED UP TO THE FORMS IN PAILS. THE SMALL YARDAGE IN THE 8-IN. WALLS DID NOT WARRANT THE ERECTION OF THE SPOUTING PLANT



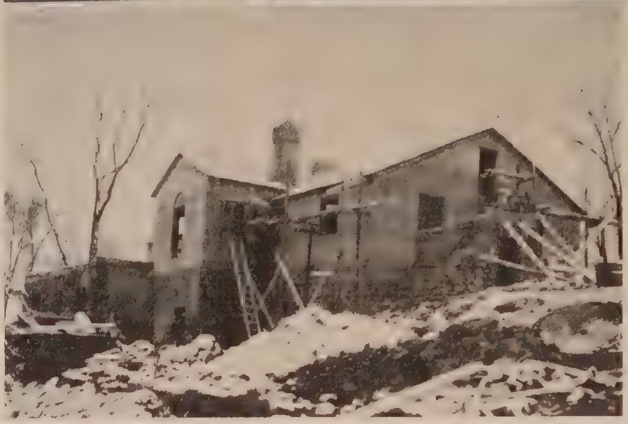


FIG. 8—VIEW FROM THE HILLTOP, THE GARDEN FRONT, SHOWING THE LOW ROOF LINES AND THE INTERESTING "BIRD-CAGE" CHIMNEY CAP JUST BACK OF THE GABLE

FIG. 9—TO THE RIGHT IS THE OUTSIDE STAIRWAY WHICH LEADS TO THE ATTIC STORY. TO THE EXTREME LEFT IS THE DRAWING ROOM AND DINING ROOM, WITH THE OPEN TERRACE ABOVE

In order to make the house free from the danger of outside fire the roof covering is of asbestos shingles[3]. These shingles are of a rough texture finish and are made in four shades of color which gives the roof considerable variety in appearance.

Little by little we Americans are beginning to realize the many advantages of the masonry house. Mr. Dana's house gives another excellent example of the possibilities in the use of concrete for home building. The modern methods such as have been here employed reduce the concrete to a cost which is lower than any other form of masonry construction. In fact with the present high cost of lumber, it is estimated that Mr. Dana's house built of permanent masonry construction has cost less than 2% more than if built of frame.

When upkeep, painting and repair are taken into consideration, the concrete house is today by far the least expensive to build.

Index to Vol. 23, July to December, 1923, will be sent to subscribers who have requested it.

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[2] International Casement Co., Jamestown, N. Y.

[3] Mohawk Asbestos Slate Co., 101 Park Ave., New York City.

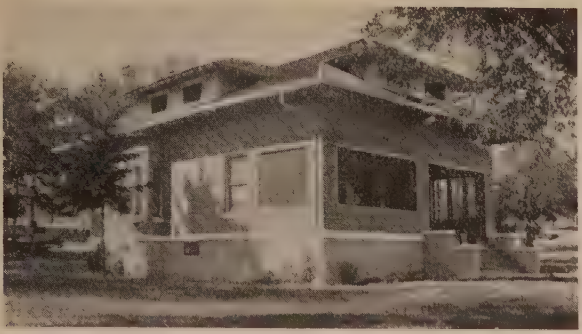


Fig. 1—A Semi-Bungalow House of Concrete Block Stuccoed with Silver-Gray Stonekote Stucco

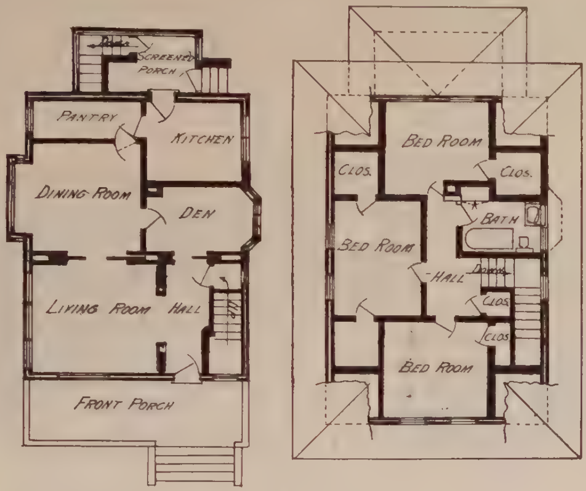


Fig. 2—Floor Plans of the House Shown in Fig. 1

Concrete Masonry Houses in Minnesota

The accompanying illustration, Fig. 1, shows a semi-bungalow residence of concrete block construction, the floor plans of which are shown in Fig. 2. It is 26 ft. x 33 ft. 6 in. in plan, exclusive of the porches.

The house is of double wall type, constructed of 3-in. and 4-in. (Helm) block with a 3-in. continuous air space between and tied together with heavy galvanized metal ties laid in the mortar joints. The entire basement is of concrete blocks.

Foundation and basement walls above grade up to the water table are plastered with gray Stonekote and dashed with mica spar aggregate. All walls above the water table are stuccoed with silver gray Stonekote stucco. The water table and window sills are of concrete finished off with white cement.

The interior trim is of ash, the first floors of maple and the second floor of fir. The basement has a concrete floor and a cistern and a hot air pipeless furnace for heating.

The cost of different kinds of concrete block used was $565. The cement, lime, stucco, Stonekote, and aggregates amounted to $160. The labor cost of the masonry, stucco and cement work is estimated at $600, as a high rate of wages was paid at the time the house was built, the year after the late war. The residence complete cost nearly $6000. It was built at Browerville, Minn. for Leo E. Heid by Lawrence A. Borgert, St. Cloud, Minn.

Fig. 3 shows the exterior and Fig. 4 the floor plans of another house built by Mr. Borgert of the semi-bungalow type, 28 ft. x 36 ft., exclusive of front porch and garage. The basement under the entire house is of concrete block and the walls are double, similar to the type described in Fig. 2.

The garage walls are of 6-in. hollow concrete tile (Duntile.) The foundation and basement walls above grade line to the water tables are of rough cast gray cement stucco, and all the walls above the water tables are finished with white Kellastone dashed with white and green aggregate. Water table and window sills are of concrete plastered with white Kellastone and floated to a smooth surface. Wood trim is in white. The interior trim is entirely of birch and all floors are of maple.

The basement has a concrete floor, coal bin, cistern, and vegetable cellar, all partitioned off with concrete block walls. Hot water heat is installed.

The different kinds of concrete block and tile for the entire house cost $755.80. Cement used for the basement floors, garage floor, rear porch floor, for footings, steps, etc., cost $116.35. The Kellastone and aggregate amounted to $185.80. The labor for masonry,

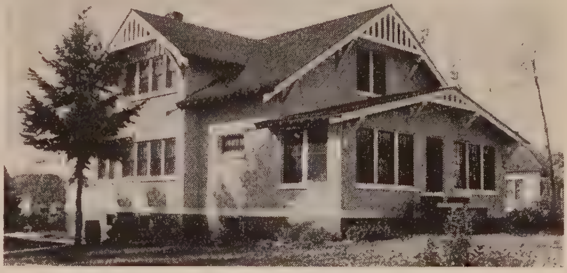


Fig. 3—Concrete Block House at Browerville, Minn.

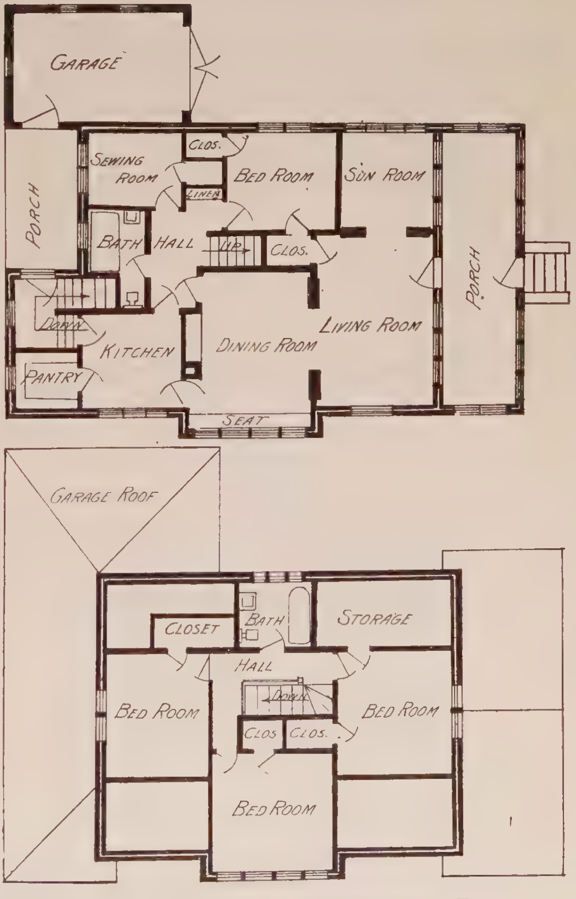


Fig. 4—Floor Plans of the House Shown in Fig. 3

cement work and Kellastoning amounted to $423.75. The entire cost of the residence was approximately $7,000.

After living in the house for over a year, the owner considers concrete block the best and cheapest material available, the house being perfectly dry at all times and easily kept warm in severe weather.

McClure Uses Wall Tie to Hold Forms

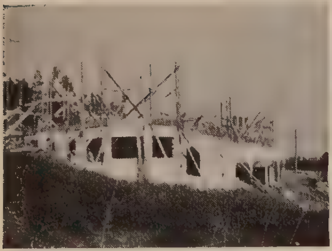


FIG. 1—RESIDENCE OF C. A. EDWARDS UNDER CONSTRUCTION IN LOS ANGELES, CALIF. ONLY ONE COURSE OF 1 x 12-IN. FORMS IS USED. THE VERTICAL 2 x 4'S ARE FOR SCAFFOLDING AND GUIDES TO KEEP THE WALLS PERPENDICULAR

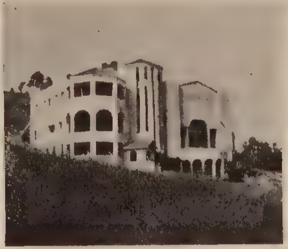


FIG. 2 (RIGHT)—THE CONCRETE WORK PRACTICALLY COMPLETED. AIR SPACE IS CONTINUOUS FROM TOP TO BOTTOM AND ALL AROUND THE BUILDING EXCEPTING THE MULLIONS AND SMALL DIVISIONS BETWEEN OPENINGS

The McClure system of building construction utilizes a combined wall tie and form holder designed for use in producing hollow walls of concrete. Figs. 1 and 2 show a house on Sunset Blvd., Los Angeles, Calif., under construction, and with the concrete work practically completed. One feature of this type of house construction noticeable in these illustrations is the absence of the usual amount of lumber for forms.

In use, the wall ties are placed in position on the ground or foundation on which the hollow wall is to be built and arranged to hold the form boards on edge and so spaced as to provide a double wall with air space between.

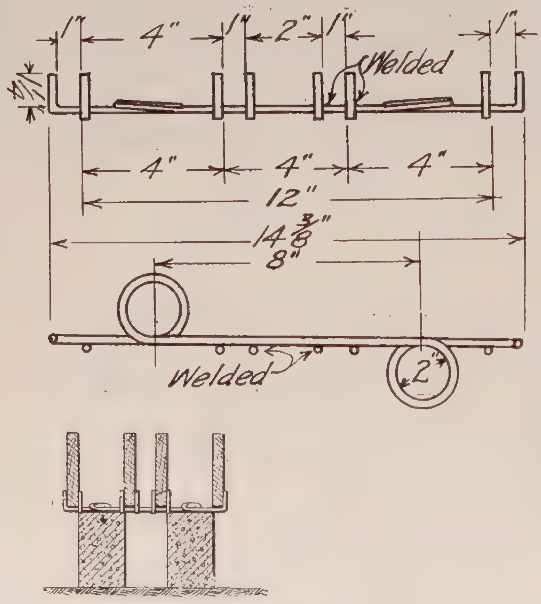


FIG. 3—DIAGRAM SHOWING H. C. MCCLURE'S PATENT WALL TIE AND FORM HOLDER FOR DOUBLE WALL CONSTRUCTION

The patent ties, the 1 x 12-in. forms and the vertical guides at corners made of 2 x 4's or 2 x 6's in the case of large buildings, make up practically the whole system. The personal element and an open mind on the part of the builder count for much of the progress, speed and effciency.

As shown in Fig. 3 the combined tie and form support is formed of wire or narrow strips of metal and each member comprises a substantially straight end portion with horizontally disposed loops. The ends of the straight portions are bent up vertically to form fingers and the intermediate fingers are welded to the ties to support the form board.

The method of construction of a double wall leaves the end portions of the tie members or those portions provided with fingers projecting outwardly from the outer faces of the parts of the wall. After the wall has been completed these projecting portions can be sheared or cut off in any suitable manner. The parts of the complete double wall are effectively tied to each other by the imbedded tie members and a firm and substantial structure is produced. A single set of four panels and a sufficient number of the combined ties and holders are all that are required of the construction of a double wall.

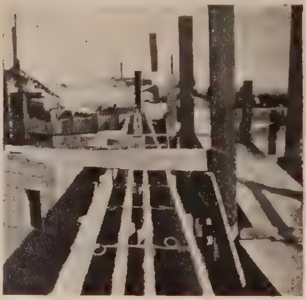


FIG. 4—(LEFT) EMPTY FORM. CIRCULAR CHIMNEY POT AND WATER PIPE MAY BE SEEN IN THE WALL

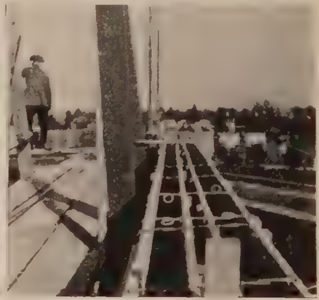


FIG. 5 (RIGHT)—EMPTY FORM ON SECOND STORY OF FRONT READY FOR POURING CONCRETE. NOTE CLEAR AIR SPACE AND ABSENCE OF VERTICAL 2 x 4'S ON OUTSIDE

It will be noted in the accompanying illustrations that only one course of forms is necessary at all times thus effecting a saving of from 50 to 60% of the amount of lumber used, with a corresponding reduction in carpenter labor. The welded fingers on the wall ties hold the boards firmly in place at top and bottom and the vertical pieces are for guiding purposes only.

In the house shown in Figs. 1 and 2, the builder poured one complete course every day, this being a large residence. In an average dwelling, two or even

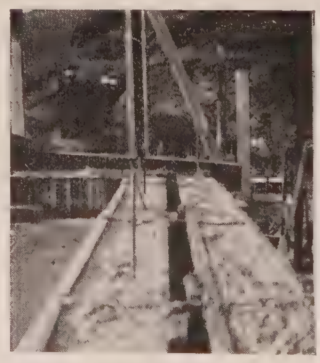


FIG. 6—CONCRETE BEFORE REMOVAL OF FORMS. REINFORCEMENT IN PLACE

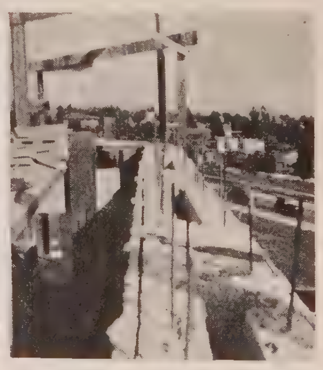


FIG. 7 (RIGHT)—SECTION ACROSS WINDOW SPACES SHOWING SOLID PORTION OF WALL WITH NO VERTICAL MEMBERS REQUIRED. REINFORCING RODS IN THE WALL ARE SHOWN

three courses can be run in a day under California weather conditions. Walls ties are spaced 15 to 20 in. apart with vertical reinforcing of 18-in. lengths of steel at the corners and in special locations. The upper surface of the concrete in each course was left as rough as possible, was well watered and thoroughly cleaned before pouring the next course. The concrete was mixed rather wet.

No special curing was resorted to after the removal of the forms but a hose was played on the concrete occasionally. No cracks developed on this job. The maximum variation in alignment in this three story dwelling was ¾ in. Plaster and concrete were applied direct on the surface of the concrete.

The form boards used were 1 in. x 12 in. and the thickness of the double walls is 4 in. with a 4-in. air space between. The 1-in. x 12-in. form boards were found more satisfactory as it would be difficult to release the inside forms if wider boards were used.

The Edwards residence at 8255 Sunset Blvd., Los Angeles, Calif., shown in the illustrations on which McClures patent wall tie and form holder were used, was built by G. E. Wright. A. F. Leicht was the architect.

An English House System of Piers and Panels

Fig. 1—House Designed for Erection at Croxley Green on the Kent System. Estimated Cost £1500

A system of house construction based on the pier and panel principle has been patented in England by Col. H. V. Kent. It is described as an economical, rapid and simple system giving strong, dry and warm houses. The piers and slabs are precast. The piers are of reinforced concrete anchored into the foundation, and the panels consisting of long, thin slabs of concrete, bridge the spaces between the piers. The piers have bolts cast in them horizontally projecting inward, and to these bolts the slabs, door frames and window frames are secured by nuts, this work being done by unskilled laborers in a very short time.

In an ordinary small house, the piers are set up at 4 ft. 6 in. intervals, and the bolts are set at 18-in. vertical intervals, the slabs being 18 in. high. In a dwelling house there are two skins of slabs, each 2 in. thick with an air space of 5 in. between, which is practically continuous both horizontally and vertically all around the house. The piers do not block more than 2½ in. of the air space, leaving 2½ in. clear.

The outer slabs are secured against the shoulders of the piers by means of saddle blocks of hard wood, which are threaded on the bolts and pressed by nuts against the vertical edges of the slabs. The outer slabs can be rebated to conceal the piers if it is so desired, and the alternate method of bolts with cotter pins can also be used.

The inner slabs are placed against the faces of the saddle blocks, and are secured there by nuts on the bolts or by the cotter pins. The nuts will usually be countersunk, the corners of the inner slabs being rebated to 1 in. and the inner face of the wall is then plastered to a flush surface.

The air space can be utilized for housing all the service pipes out of sight, and it is recommended by the inventor of the system that in blocks of barracks or even in a village of detached cottages, built on this system, every house can be heated from a central refuse destructor with a hot pipe run around the house inside the wall so as to give a warm air jacket. In a tropical climate, it would be possible to drive refrigerated air into the walls to lower the resulting temperature inside the buildings.

A door frame takes the place of 5 slabs, and a window frame takes the place of 3 slabs.

The upper floors can be laid on horizontal reinforced concrete slabs, bridging across reinforced concrete floor beams, resting on corbels precast on the piers; and a jointless ¾-in. floor can be laid over the slabs, with rounded up corners at the walls in lieu of skirting boards, so there is no place where dust can lodge.

In construction work, the first operation after cleaning the ground is to get the foundations and footings in place. Any carpenter can make the molds for the piers and slabs, care being taken to space the bolts accurately and fix them at right angles and to place the reinforcing rods correctly. The columns can be cast flat at right angles to the sides of the house, and pockets should be left in the concrete foundations for the projecting rods to dip into. The columns can be up-ended by hand with the assistance of small shear legs until they are vertical. They should then be guyed and set true with a plumb-bob, and the pockets filled with a rich grout.

The slabs are made of saw dust composition, such

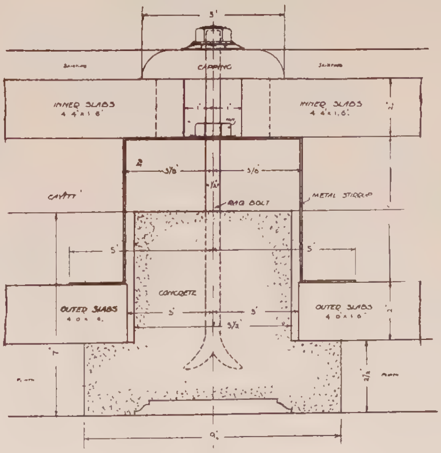


Fig. 2—Diagram Showing Section of Pier and Method of Placing Slabs for Inner and Outer Walls

as Woodcrete, possessing the advantages of being damp proof, non-conducting and fire-resisting, and at the same time can be nailed, screwed, and sawed.

When the columns are set, the outer slabs, and window frames and door frames are set in position and the nuts tightened. No mortar or grout is required between the horizontal edges of the slabs, but they can be tongued and grooved, and no rough casting outside is required. The laying of the reinforced floor slabs on the beams is simple.

Partition walls can be taken off any part of the outer walls by making slots 3 in. wide down the slabs, and they can also be made on the same principle of 3-in. Woodcrete slabs, plastered on both sides, making 4-in. solid walls.

It is claimed that the system will lend itself to almost any style of architecture, as the form of the piers can be varied in many ways, or can be easily made to produce round or square columns, plain or fluted or panelled. The column can be made flush with the face of the wall.

As all of the units are precast and no mortar is required, there need be no stoppage of work in frosty weather, so that there should be no difficulty in completing a 25,000 cu. ft. house in a little over a month with 90% of unskilled labor.

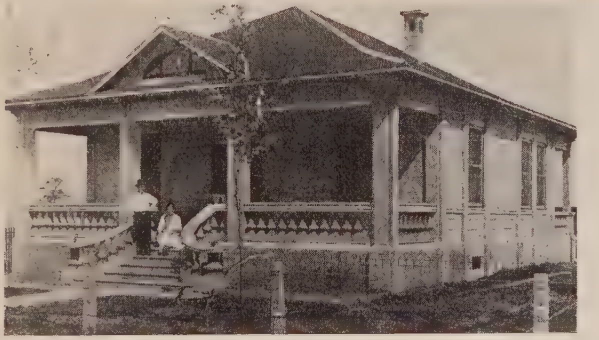


Fig. 3—Reinforced Concrete House Built of Dvorak Precast Units

Dvorak System of Wall Construction

The system of house construction patented by W. J. Dvorak, Houston, Texas, is illustrated in the accompanying diagrams, Figs. 1 and 2. It consists of precast columns and slabs about 1 ft. wide molded on the ground and then fitted together.

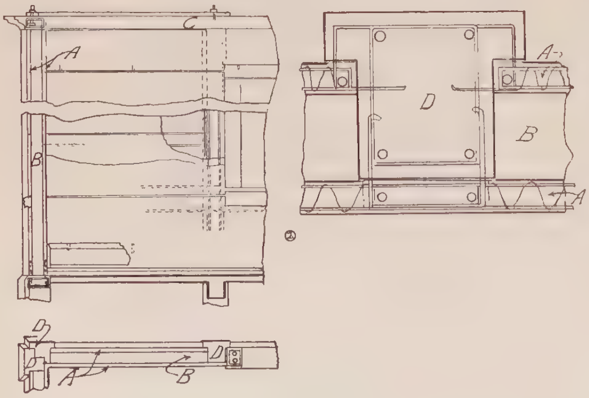
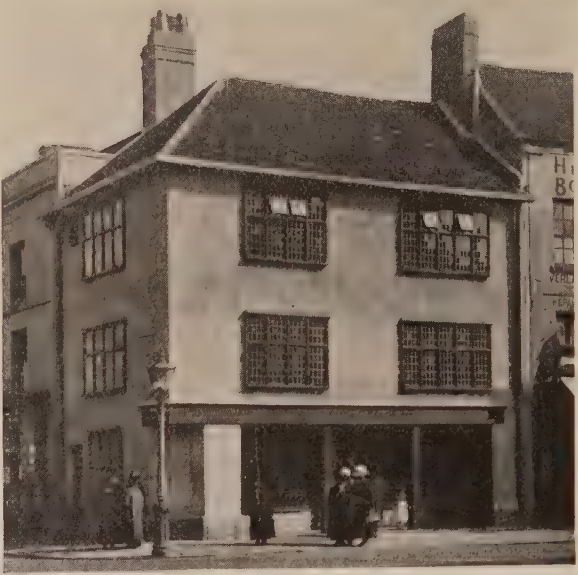


Fig. 1—Sectional Diagrams Showing Column and Slab Arrangement

In Fig. 1, *A* represents sections of the wall, the slabs being about 2 in. thick and *B* the air space between. The columns are spaced from 2 ft. to 6 ft. apart according to the layout of the doors and windows. Both columns and slabs are reinforced and the columns are tied together by a continuous horizontal reinforced concrete beam *C*. *D* represents a section of the reinforced concrete columns.

The reinforcing as shown in Fig. 2, consists of two

Stucco Restores Stratford-on-Avon Landmark



Shakespeare asks in one of his plays, what shall endure *"gainst the tooth of time and razure of oblivion."* The answer of course, relatively speaking, is concrete.

It is therefore interesting that a "restoration" has just been carried out at Stratford-on-Avon on a building with Shakespearean memories. Judith Shakespeare, daughter of William Shakespeare and Anne Hathaway, after her marriage to Thomas Quiney, vintner, lived for 36 years in a house at 1 High Street, Stratford-on-Avon. This house was an Elizabethan dwelling, half-timbered, with overhung eaves and gables and the usual face of oak and plaster. Early in the last century an attempt was made to "restore" it but the result was very unsatisfactory. It was recently rescued from its state of conspicuous ugliness by W. H. Smith & Son, book-sellers, and the present tenants of the premises. The restoration was carried out under the direction of Guy Pemberton, L. R. I. B. A. of the firm of Osborn, Pemberton & White, architects, Stratford-on-Avon. Mr. Pemberton directed that the restoration should be done in Atlas white portland cement stucco. The picture shows the result.

The house of Judith Shakespeare is owned by the Stratford-on-Avon Corporation, and forms part of the Guild Estate. Half the rent of the building goes to the King Edward School, as it did in the days when Shakespeare was a schoolboy there.

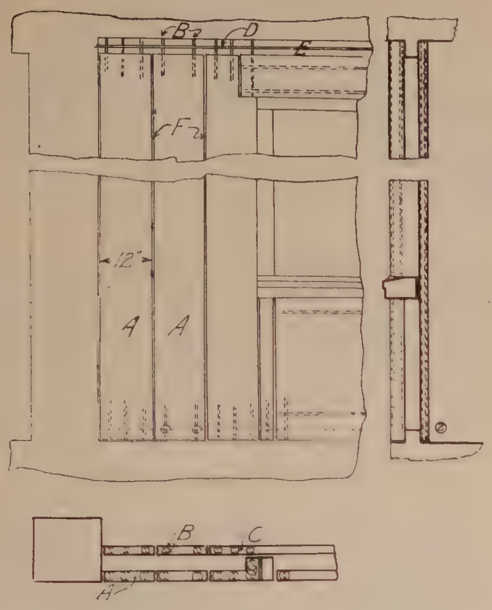


Fig. 2—Diagram Showing Reinforcement

pairs of ⅜-in. bars *B* wrapped by a wire spiral *C* for each slab. The rods extend beyond the precast slabs and an anchor rod *D* is tied to the projecting ends. The space *E* is filled with concrete making a complete beam.

The joints *F* between slabs are filled with cement mortar. No plastering is necessary for the outer face and only one coat is needed for interior finishing.

The system is claimed to be adaptable for partition walls, curtain walls, and veneer walls, as well as for garages and factory buildings in place of corrugated sheet iron. The cost of a partition wall 10 ft. high and 2 in. thick, complete, is given as 25¢ per sq. ft.

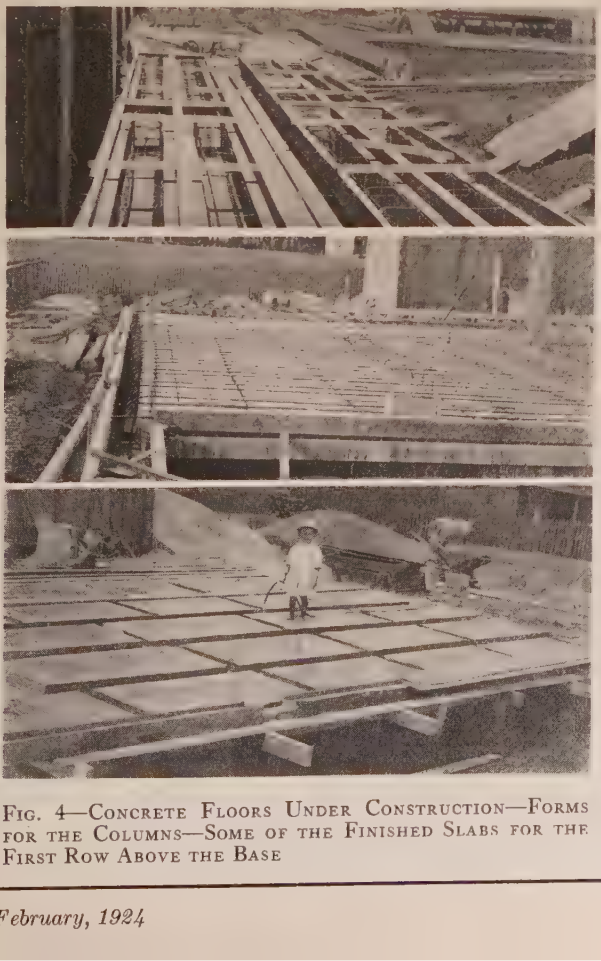


Fig. 4—Concrete Floors Under Construction—Forms for the Columns—Some of the Finished Slabs for the First Row Above the Base

Fig. 3 shows a house built on the Dvorak system. It is 33 ft. x 46 ft. Including galleries, the ceiling is 10 ft. high. There are four rooms with bath, halls and sleeping porch. The basement is 8 ft. x 10 ft. and 6 ft. deep. Footings are 2 ft. in the ground, each column footing being 30 in. square and 6 in. thick. The roof is covered with red strip shingles. The cost of the house in 1918 including septic tank and drain pipes was $2800 for labor and material.

Aggregate Tests for Boulder Canyon Dam

Another line of work now under way by the Bureau of Standards involves the testing of samples of sand, gravel and rocks from the vicinity of Boulder Canyon, on the Colorado river, Western Arizona. Quite an extensive series of preliminary tests has been made. The samples are representative of materials now under consideration as possible sources of aggregate for the concrete work on the dam. The testing is of particular interest as problems are involved which do not ordinarily arise in the eastern part of the country. For example, the rocks from the Boulder Canyon region cannot be accepted as suitable aggregates merely from the fact that they meet the prescribed physical tests. What is more important is an examination for constituent minerals that may be subject to comparatively rapid alteration and disintegration. This phase of the work is very largely in the hands of the U. S. Geological Survey, but certain experimental "soundness" tests for durability of these aggregates are being conducted by the Bureau of Standards.

In addition to the foregoing, the characteristics of these materials and the probable necessity for using stone screenings as fine aggregates, introduce new problems in designing suitable mixtures, particularly those which will have the proper degree of workability and water tightness, and at the same time the necessary strength. About 25 preliminary combinations have been made up into concrete cylinders, and further combinations and long-time test specimens will be made after the 28-day strengths of the preliminary mixtures have been determined.

Seasonal Variation in Construction

At the request of one of the committees of the President's Conference on Unemployment, the Division of Building and Housing is conducting a survey of seasonal construction. A progress report was recently presented and as soon as the work is finished a complete report will be issued. It is expected that this final report will cover weather conditions and their effect on the efficiency of labor, use, production, and haulage of materials, and the extent of seasonal variations in building activity in cities throughout the country. The effects of these variations on building trades, labor contractors, material producers, and the general public will be treated. The importance of this to everyone will be appreciated when it is remembered that the public pays for the waste involved under present conditions through higher cost for buildings. The effect of customs, such as uniform leasing dates, and other factors not dependent on climate will be given consideration along with a discussion of methods of economical winter building. It is believed that savings, not only to the building industry and its workers, but to the general public, will result.

Program of the Institute's 20th Annual Convention

How to control the quality of concrete, putting scientific knowledge into everyday practice both in the construction field and in concrete products manufacture is the outstanding subject matter in the tentative program announced by the American Concrete Institute for its 20th Annual Convention to be held at the Drake Hotel, Chicago, February 25 to 28 inclusive. This of course is in addition to the special program of Anniversary Day—Wednesday, February 27. Another feature of the meeting will be an exhibit in 10 to 12 different departments of concrete work to set forth in photographs, charts, models and samples of concrete the progress of 20 years. The Anniversary Day Program concludes with a banquet in the evening. The tentative program as published in an Institute *News Letter* of January 25, is outlined as follows:

Monday, February 25—2:00 p.m.—President W. P. Anderson, chairman.

"Old and New Methods of Constructing Concrete Bridges," J. B. Hunley, Engineer Bridges and Structures, C.C.C. & St.L.Ry., Cincinnati, Ohio.

Mr. Hunley's paper will describe ordinary methods used in proportioning and mixing concrete and the application to recent concrete bridge work of more refined methods to produce concrete of a desired strength at the least cost, with a discussion of results obtained.

"New Practice of Iowa State Highway Department for Control of Quality of Concrete", R. W. Crum, Engineer of Materials and Tests, Iowa State Highway Commission, Ames, Iowa. "Relation Between Wall Thickness and Diameter of Concrete Culvert Pipe for Highway Use," G. W. Hutchinson, assistant engineer, North Carolina State Highway Commission, Raleigh, N. C. "Culvert Pipe Standards," Committee J-2, B. S. Pease, chairman, A brief progress report. "Proposed Tentative Specifications for Concrete Roads and Pavements," One Course and Two Course Concrete Pavement for Highways and One Course and Two Course Concrete Street Pavement, Committee S-6, W. M. Acheson, chairman. "Proposed Tentative Specifications for Drain Tile and Sewer Pipe," Concrete Drain Tile, Plain Concrete Sewer Pipe, Reinforced Concrete Sewer Pipe, Committee P-7, C. F. Buente, chairman.

At 8 p.m. there will be two, simultaneous sessions, one for discussion of on-the-job problems by and for construction superintendents, with vice president M. M. Upson, chairman. About 30 live questions have been asked by concrete construction superintendents and they are being assigned to discussion leaders in each case.

The other Monday evening session will be similar in nature for concrete products manufacturers with A. J. R. Curtis, chairman. A report, "Application of Abrams Theory to Concrete Building Units with Results of Tests," Committee P-6, John Lowell, chairman, will be followed by the products manufacturers question box and general discussion.

Tuesday, February 26—9:30 a.m.—Richard L. Humphrey, chairman.

"The Selection and Design of the Contractors' Plant." Committee C-1, J. G. Ahlers, chairman. The outline of this report indicates a comprehensive survey, with recommendations, governing the choice of equipment and methods of operation. The report is not confined to building construction but includes work of other kinds, particularly jobs covering considerable area. "Measurement of and Estimating Concrete," Committee C-5, Frank R. Walker, chairman. "The Economic Value of Admixtures," J. C. Pearson and Frank A. Hitchcock, United States Bureau of Standards, Washington, D. C. "Three Proposed Standards," adopted as tentative at 1923 convention, will be presented with resolutions from the originating committees that they be referred to letter ballot for adoption as Standards. "Proposed Standard Specifications for Concrete Floors" Committee C-2, N. M. Loney, chairman. "Proposed Standard Specifications for Reinforced Concrete Chimneys," Committee S-1, Eric Plagwit, chairman; "Proposed Standard Specifications for Concrete Sewers," Committee S-3, Langdon Pearse, chairman; "Proposed Tentative Specifications for Concrete Sidewalks," Committee C-2, N.M. Loney, chairman.

12:00 noon—Meeting of Committee on Committees, S. C. Hollister, chairman.

2:00 p.m.—Demonstration of operations in the manufacture of trim stone and ornamental concrete—from models to surface-finished concrete products. R. F. Havlik and several assistants from Mooseheart. This demonstration is especially for concrete products manufacturers, and for architects and others interested in commercial methods of producing concrete casts of specified design and finish.

8:00 p.m.—W. K. Hatt, chairman. "Proposed Tentative Recommended Practice for the Design and Construction of Concrete Dwelling Houses," Committee S-5, J. A. Ferguson, chairman; "The Fire Resistance of Concrete Block," Committee P-5, Leslie H. Allen, chairman. A complete outline of results of the recent fire tests by Underwriters' Laboratories for the Institute, made possible by contributions totaling $6,000 from The Portland Cement Association. The American Concrete Institute and members and friends of the Institute and of the Concrete Products Association. "Nomenclature," Committee G-4, W. A. Slater, chairman. "Revision of Tentative Standard Specifications for Concrete Building Block and Concrete Building Tile and of Tentative Standard Specifications for Concrete Brick," Committee P-1, Wallace R. Harris, chairman. "Progress of Proposed Standardization of Dimensions of Concrete Building Units," Committee P-1. "Suggested Forms for Reports of Tests of Building Units," Committee P-1. "Proposed Tentative Specifications for Concrete Staves," Committee P-4, Walter O. Brassert, chairman.

Twentieth Anniversary Day, Wednesday, February 27, set aside to celebrate both the growth of the Institute and the tremendous strides which the concrete industry has made in the 20 year period just closed. The day's celebration consists of three major parts: 1. Addresses by leaders in the industry. 2. A unique exhibition. 3. A banquet. The speakers under Part 1 are as follows:

10 a.m.—Richard L. Humphrey, Philadelphia, who will act as "Presentor" and introduce each speaker, opens the celebration with a historical address touching on the circumstances which led to the Foundation of the Institute, mentioning some of the men who were outstanding figures at that time, the principal uses of concrete and their relative importance 20 years ago, the extension of the uses of concrete and their relative importance now. F. W. Kelly, Albany, "Cement is the Magic of Concrete;" Prof. A. N. Johnson, Baltimore, "Concrete Roads;" A. P. Davis, Washington, "Mass Concrete;" A. W. Ransome, San Francisco, "The Mechanical Equipment for Handling Concrete."

1:30 p.m.—Session opened by Mr. Humphrey. Albert Kahn, Detroit, "Reinforced Concrete Buildings;" A. E. Lindau, Buffalo, "Concrete Bridges;" M. M. Upson, New York, "Concrete for Foundations and Water Front Work;" R. F. Havlik, Mooseheart, Ill. "Concrete Products;" John J. Earley, Washington, "Architectural Concrete;" Prof. A. N. Talbot, Urbana, Ill., "Engineering Research;" Prof. Duff A. Abrams, Chicago, "Making Good Concrete;" Richard L. Humphrey, "The Promise of Future Development."

Part 2—The Exhibition—The exhibition will be held in the French Restaurant of the Hotel Drake immediately across the corridor from the Convention Hall. It will open with the convention Monday morning and remain open until the convention closes Thursday evening. This exhibition is absolutely non-commercial in every respect. It is simply an attempt to illustrate the various addresses already listed.

Part 3—The Banquet—The banquet at the conclusion of the celebration will be held in the ballroom of the Hotel Drake at 7:30 p.m. Speakers of national prominence have promised to entertain us—music and singing are provided.

Thursday, February 28—9:30 a.m.—A. E. Lindau, chairman.

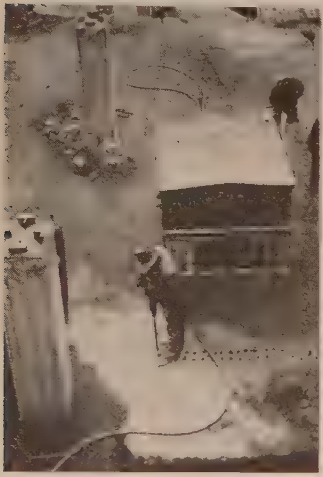
"Field Tests of Concrete," J. G. Ahlers, chairman New York Group of Contractors' Committee and Stanton Walker, associate engineer, Structural Materials Research Laboratory, reporting the results of field work in the control of quality of concrete. "Suggestions for the Production of Better Concrete," Committee C-6, R. L. Bertin, chairman. "Serious Concrete Failures and Their Causes and Remedies," Committee E-6, M. M. Upson, chairman. P. J. Freeman and J. A. Ferguson presenting individual reports covering two failures. "Progress Toward Aggregate Specifications," Committee E-5, H. S. Mattimore, chairman.

11:45 a.m.—Business session.

2:00 p.m.—W. P. Anderson, chairman. "Expansion Joints in Concrete Construction," Committee E-8, Langdon Pearse, chairman. "Bending Moments in Columns," F. E. Richart, University of Illinois, Urbana, Ill. "Current Progress in Our Field and Proposed Design Treatment for Two-way Slabs," Committee E-1, A. R. Lord, chairman. "Waterproofing Concrete," Committee E-7, S. C. Hollister, chairman.

Reinforced Concrete Structure Resists Wreckers' Efforts

The wrecking of the reinforced concrete in the Eldridge-Higgins Co.'s building on Ontario street, Cleveland, Ohio, to make way for the new union station proved unusually difficult and the resistance which the structure offered to the efforts of the wreckers makes it evident that the original builders who were in charge of the construction of the building believed in permanent construction and concrete for permanence. The demolition of the building has attracted more than local attention on account of the resistance to all of the methods of attack—sledging, blasting, drilling and oxy-acetylene torch.



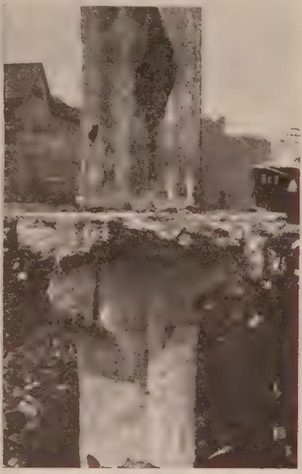
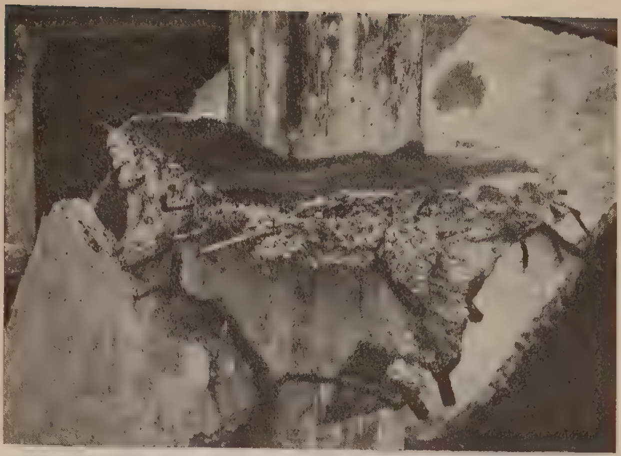


Fig. 1—(Left) Air Drills Working on Fourth Floor Eldridge-Higgins Bldg. Average Time of Penetration of Air Drill Four Minutes

Fig. 2—(Right) Close-up of a Stripped Column with Juncture of Beams and Floor of Slag Concrete Supporting a Continuation of the Column (Upward of Gravel Concrete)

The original structure, as erected early in 1908 by the Reaugh Construction Co., Cleveland, Ohio, occupied a 127 ft. frontage on Ontario St. with a depth of about 145 ft., and consisted of 6 stories of typical reinforced concrete supported by columns designed for 350 lbs. per sq. in. Through its life the building was utilized as a grocery warehouse. Part of the structure was supported on Simplex piles and the floors were 8 in. thick of reinforced concrete and wall panels for the most part were built of 4-in. paving brick.

One point of particular interest was the fact that all three of the types of aggregate commonly used in Cleveland were utilized in the construction of this building. Stone was used as the aggregate in the piles and some of the footings. Gravel was used in some of the columns and slag was used in the floors, part of the columns and also in some of the light 8-in. curtain walls at the rear of the building. The mixture used in the concrete, according to the recollection of T.W. Carroll, chief engineer for the Reaugh Construction Co., was approximately 1:2:4 with the large aggregate ranging from ¼ to ¾ in. in size. This building was one of the first in Cleveland in which slag was used as a concrete aggregate.



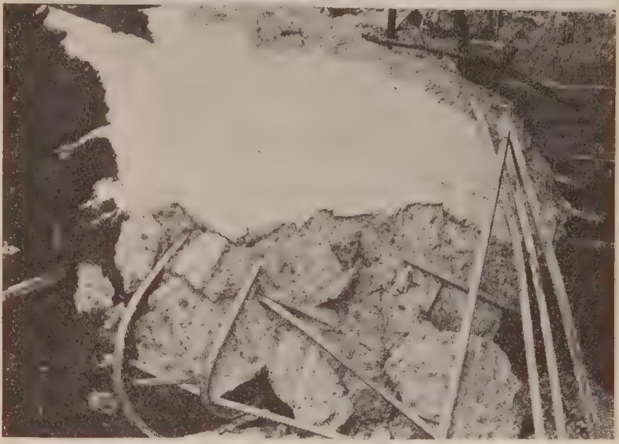


Fig. 3—Still Closer View of Column Identified in Fig. 2 Showing Cross Section of Beam and Floor Construction in which Slag Was Used as Aggregate

Fig. 4—Close-up of a Portion of 8-in. Wall at Rear of Eldridge-Higgins Building. Cleveland, Ohio, Constructed of Slag Concrete. Note Freedom from any Indication of Even Rust Spots in the Bed Occupied by the Steel Bars

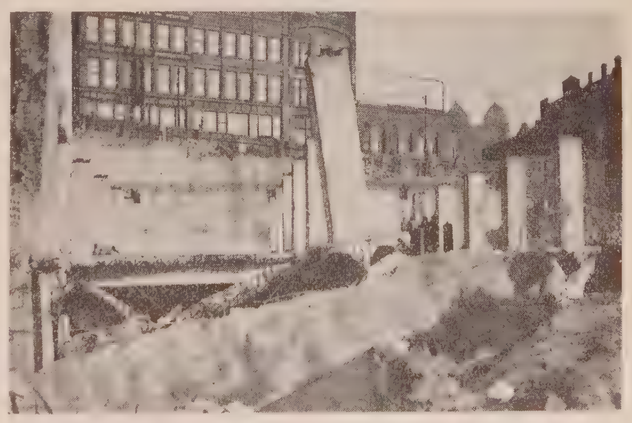


Fig. 5—Column in Right Foreground Being Weakened at Base This Photo Shows Clearly the Method of Attack in Razing Building and Result of Their Efforts Utilizing Air Drill and Torch Indicated on Cross Section of Slab Shown

All reinforcing steel, no matter in which kind of concrete it was imbedded, appeared clean and blue when exposed by the wreckers, giving evidence that the concrete was permanent and that the sulfur content did not attack the reinforcing steel.

Slag was used as an aggregate in this building largely because of inability of the producers of other aggregates to deliver material on the job during the exceptionally cold weather that prevailed at the time. The temperature was well below freezing practically all of the time of the construction of the building above the foundations and exceptional precautions had to be taken with the

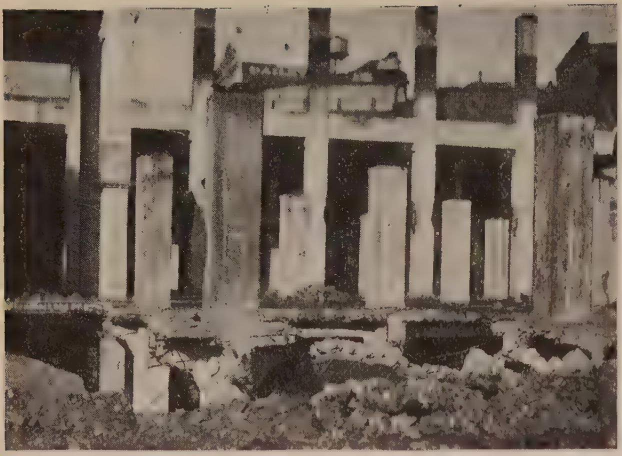


Fig. 6—Cross View of a Few Columns Remaining After Building is Partly Demolished

concrete in mixing and placing. Sand, water and the large aggregates were heated before being placed in the mixer.

Records of the construction work indicate that the slag arrived on the job while still warm and that it steamed for considerable periods of time in stock piles at the site. The slag was processed and hauled onto the job within a few days after it had solidified sufficiently at the pits of the blast furnace to permit steam shovels going in on the initial movement of loading it onto cars for hauling to the crushing plant.

Work of demolition on the building was done by the Walsh Construction Co., Davenport, Ia., and the methods used are illustrated in the accompanying figures. Double lines of holes were drilled along the edges of the main beams and the webbing between the holes broken out with a buster after which an oxy-acetylene torch was used to cut the steel allowing the individual slabs to drop to a position from which they could be dragged out by chains and loaded onto flat cars.

The beams were weakened at the junction with the columns by the same method of exposing the steel and then cutting it with the torch, and finally the columns were dropped section by section in the same manner.

Durability of Metal Lath

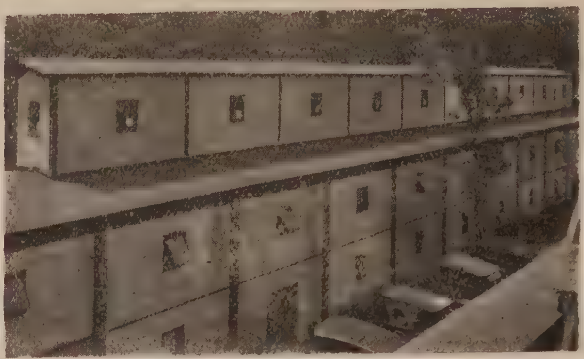
A Letter from J. C. Pearson

U. S. Bureau of Standards

Many of the readers of Concrete will doubtless be interested in knowing that in preparation for the erection of a number of new stucco panels at the Bureau of Standards this fall, some twenty of the old panels erected seven or eight years ago were torn down, and a very good opportunity was offered to examine the condition of the metal lath.

The panels referred to are shown in the accompanying illustration, and include the ten panels on the "pent house" (erected in 1916) and the twelve panels on the second story of the main building (erected in 1915). The latter group consisted of a variety of stucco mixtures on metal lath applied over ½-in. crimped furring and 8-in. sheathing. Of the ten panels on the "pent house" six had metal lath bases attached in various ways to 2 x 4 studs, no sheathing being used. Of these six, three were back plastered and three were left with metal lath and plaster keys exposed on the inside.

The interesting fact about these metal lath bases was that not one of them showed any traces of rust or deterioration at the time of their removal in October, 1923. This condition was not surprising in the case of the galvanized lath, but eleven of these old panels were erected on painted or dipped diamond mesh lath, and as the majority of them were scratch-coated with haired plaster, the back of the lath was not always completely covered. Moreover, a number of these panels developed fairly large cracks, which although conspicuous enough to detract from the appearance of the stucco, did not apparently permit water and air to penetrate through to the lath in sufficient amounts to do any structural damage or cause any corrosion.



The stucco mixtures varied from straight 1:3 cement-sand mortar to cement-gaged lime mortar containing three-fourths lime, one-fourth cement and four parts of sand. One of the back plastered panels on painted metal lath was stuccoed with a mortar of one part cement to six parts limestone screenings.

The condition of these panels bears out the remarks which accompany the Standard Recommended Practice for Portland Cement Stucco of the American Concrete Institute, which are quoted in part as follows: "While portland cement stucco may develop certain defects which cannot always be guarded against, the product may be depended upon, if applied in accordance with the accompanying practice, to be structurally sound, durable and capable of giving satisfactory service, with little or no outlay for repairs or maintenance." The degree of durability implied in the foregoing quotation is, of course, only relative, but from the evidence afforded by these panels, we may reasonably expect a properly applied cement stucco to last as long as an ordinary frame house would last without more or less complete renovation.

Minimum Requirements for Masonry Wall Construction

The Building Code Committee of the Department of Commerce is preparing its report on Recommended Minimum Requirements for Masonry Wall Construction. The report, in tentative form, was submitted to organizations and individuals cooperating with the committee, and is now being put in final shape in the light of the criticisms and suggestions received from such organizations and individuals. Upon completion, it will be published as the second report of the Building Code Committee. The first report of that Committee, entitled "Recommended Minimum Requirements for Small Dwelling Construction," is on sale by the Superintendent of Documents at 15¢ a copy.

House Built by Olmsted System

The house shown in the accompanying illustration was built by Arthur H. Olmsted at Rye, N. Y., by a system of construction which was described briefly in CONCRETE some time ago. The basis of it is a precast concrete stud having inserts by which the forms are supported. These studs have openings to permit the placing of reinforcement and are notched at the top to admit a 2 x 4. This 2 x 4 serves as an aligning timber so that comparatively few braces (see Fig. 2) hold the forms in place

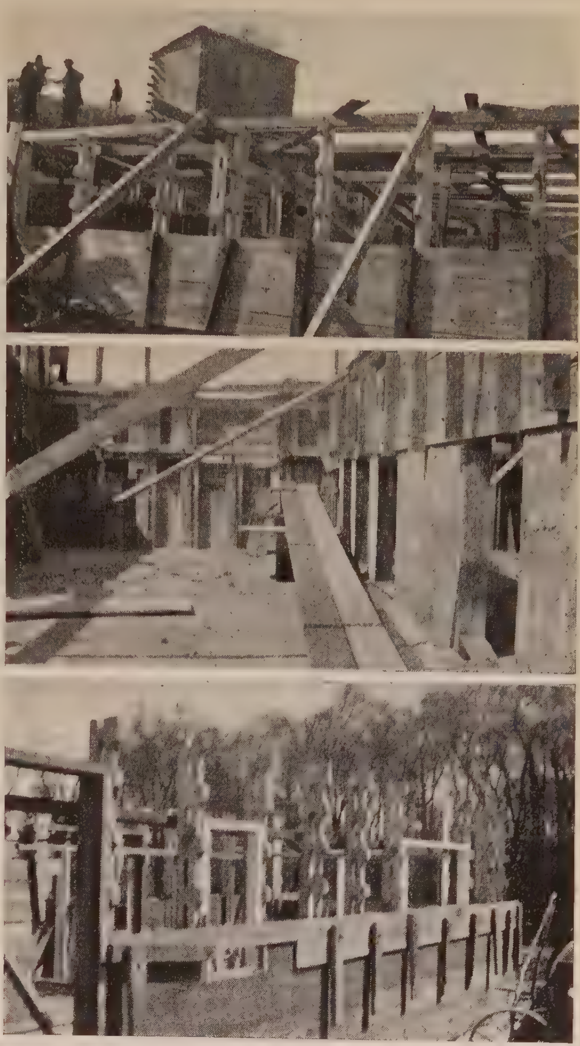
In building a house by this system the footing is poured and while still green precast concrete aligning slabs are set. These project 1½ in. above the footing. This projection holds the concrete studs in alignment at the base. Studs are placed about 30 in. o. c. and in all cases at each side of an opening. Door and window frames are spiked (if blocks or a nailing mix is used) or bolted to them. Ordinary shiplap forms may be used, held in place by rangers which are lag screwed to the inserts in the studs. Forms may be hung for a full story height or any part of that and raised when a section is poured. Studs eliminate much of the pressure of concrete against the forms and the full story may be poured at once, according to Mr. Olmsted, without the danger of buckling. If ordinary boards are used for forms they are supported by tacking to every third stud until the rangers are screwed into position. Boards need not be sawed off but may run past the openings or corners. Each story is a repetition of the same operation.

The floors in the Olmsted house were formed by making wood domes covered with tar paper which, after being used several times, were taken apart and the lumber used in other parts of the building. In the house at Rye the side walls above the basement were cored between the studs forming an air space using a form similar to the dome system used in the floors. Recesses and openings in the studs not only permit reinforcement but allow the concrete from one section to flow into adjoining sections making a monolithic wall.

Mr. Olmsted writes:

"West Chester County is a rugged stony country and all the stone work shown in the picture is made from stone gathered on the site. The roof is of concrete roofing tile made by the Connecticut Roofing Tile Co., Stamford.

"Just a few details about the construction: Basement walls, poured concrete; first story walls, reinforced concrete; second story walls in gables, concrete block; main bearings walls, reinforced concrete; rafters, 2x10 fir; finished floors—living rooms $\frac{13}{16}$-in. oak nailed to sleepers anchored to concrete. Outside reinforced walls 5 in. thick between studs and 8 in. thick at studs with plaster board nailed at studs and three coat plaster work with sand finish. One section of the house was finished by using a heavy insulating paper back of Herringbone lath nailed to the studs; this section I like very much and not a single plaster crack of any description has developed and it appears as warm as where the plaster board was used. The floor construction is of the dome method, the domes were made of wood which later became a part of the house and I believe that a ten dollar bill would cover all waste material. The side wall design is similar to the floor only set on end. Windows, steel casement frames; heat, hot water; plumbing, three baths, including three showers; floors of baths and kitchen, troweled concrete with cork composition. Garage, two car under main part of house. Stucco: White portland cement with yellow sand."



HOW THE ARTHUR H. OLMSTED HOUSE, RYE, N. Y., WAS BUILT. BOARD FORMS ARE HUNG ON PRECAST CONCRETE STUDS

On-the-job problems will be discussed by Concrete Construction Superintendents at the A. C. I. Convention, Chicago, Feb. 25-28.

Winter Stops Work But 14 Days

J. Reid Kilpatrick
Vice President of the George A. Fuller Co. New York

From address at December Meeting of New York Building Congress.

The problem of winter construction is largely one of geography. The operations of our company extend from Florida to Northern Canada, and we run pretty nearly the whole gamut of temperature conditions. There is no problem of winter building up to and including Washington. Temperature conditions permit all the year round with very slight interruption. When we get up to New York and Philadelphia, the condition begins to change, and it gets progressively worse as we get up to Boston and above.

For New York we have prepared statistics extending from 1912 to 1922, a 10-year period, and we have found the average length of time that a winter building program would be rendered impossible due to temperature conditions is 14 days.

This means that out of the whole winter there are on the average only 14 days in which we cannot work. It is necessary to consider the figures for a rather extended period, because one job, or two jobs, or three jobs, running one, two, and three years, give a result which might mislead one in drawing general conclusions. The periods in which work is interrupted run from 5 to as high as 31 days. That is, some years only 5 days are unfit for work, and in others, it runs as high as 31. The average for the 10-year period is 14 days.

This fourteen days condition in winter is not a great deal. When we consider building in and around New York, we have to divide it into certain different categories. There are four main groups in which construction in and around New York falls. There is home building. By that I mean the frame buildings, such as are built in New Jersey and on Long Island and in the Bronx. The 5-story wall bearing jobs constructed throughout Brooklyn, the reinforced concrete factory work, and lastly skeleton steel construction, such as apartment houses, hotels, office and loft buildings, develop a different problem.

I think there is not much we can do about home building. One cannot do a great deal in the country with solated buildings in the winter time, and there is little hope of spreading that work over the entire year. The same reasoning applies to the 5-story wall bearing jobs. It is extremely hard to protect the men on the wall bearing jobs, because there is no hanging scaffold on which to suspend the protection. It is hard to expect that type of construction to extend over the entire year.

In New York those jobs can be started in April, or in the early spring, and be cleaned up by fall. They take only six to seven months to build.

There is nothing new about winter construction. It has been done for years. Going back over twenty years, we find some of our most prominent buildings in New York were built in the winter time. The Atlantic Mutual building and the Broad Street Exchange building were completed during the winter of 1900 or 1901. The methods of carrying them on are very similar to those which prevail today. The one difference is that in those days there were no hanging scaffolds. Instead of hanging the tarpaulins to protect the bricklayers on the scaffold itself, a light framework was built up which was attached to the steel on the floor above.

Our present problem is somewhat similar, as the hanging scaffolding makes it quite simple and easy to protect the bricklayers.

Excavating is now as simple and as easy in the winter as it is any other time of the year. We never see hand excavation any more. It is all done by steam shovels, which can work in frozen ground very nearly as easily as they can when the ground is soft. The placing of the concrete is not a serious problem. It is a very simple matter to heat the aggregate. The manner in which it was heated years ago still obtains. It consists in building a fire in a large section of corrugated iron pipe and putting the sand stone on top to keep the frost out.

Concrete can be poured with a reasonable degree of safety down below 20 degrees above zero, provided it is protected at night, by merely placing tar paper on top of the work. We have poured concrete at 40 degrees below zero in Canada. That was a different problem. Steam heat had to be used, and the work had to be housed in but the foundation work in New York is easy to handle.

In structural steel there is no particular problem. The work may be interrupted by snowstorms, but the quantity of work a man does is not restricted by the temperature.

The opinion has existed for some time that steel work in winter is particularly hazardous on account of the ice and snow. I have investigated this, and find that there is really no difference.

We can lay brick at 23 to 25 degrees above zero, as our various foremen have told us; they are convinced that we can go considerably lower than that if necessary. However, the common opinion is that it is bad to get under 20 degrees.

The normal steel job extends over a year. Splitting the year up into three- or four-month periods, such as August, September, October and November for the fall, December, January, February and March for the winter, and the remaining four months for the spring and summer, there is no particular difference in the analysis for a period. No matter whether the job begins in the winter months, or whether it begins in the summer and goes up to the spring or early summer, there is no difference in our figures of costs.

In fact, we prefer to start work in the fall, and clean up the excavating so that the structural steel can be set in November or December. This carries the masonry and outside work during the winter. That just misses the peak demands for mechanics.

It is very difficult to analyze the cost figures and determine whether one actually makes more or less money by building in winter than in spring and summer. However, we prefer to set our steel and put up our brickwork in the winter months. It is easier to get the finishing trades. Winter work also avoids the peak loads of the finishing trades.

Winter work is not new, revolutionary or untried. We have been doing it in New York on big jobs for the last 23 years, and any thing that can help iron out the peaks in employment and build up the depressions cannot help but be an excellent thing for our industry.

Attend the American Concrete Institute Convention, Chicago, Feb. 25-28, and discuss your concreting problems.

Graded Aggregate

A. E. Lindau

A. E. Lindau has resigned as vice president and director of the Corrugated Bar Co., Inc., with which company he has been connected for nineteen years, to become the president of the American Wire Fence Co. of Chicago, Ill., operating the American System of Reinforcement, fabricators and dealers in reinforcing material. The American Wire Fence Co. has been established for thirteen years and has operated extensively throughout the middle west. Mr. Lindau is a graduate of the Engineering Department of the University of Michigan, of the class of 1900. For a short time after graduation he was connected with the commission appointed by Governor Pingree to appraise the value of railroad property in the state of Michigan. A short time spent with the Whiting Foundry Equipment Co., Harvey, Ill. was followed by experience in bridge detailing and design with the Wisconsin Bridge Co., the C. B. & Q. Ry., and later as assistant engineer in the bridge department of the Rock Island Railway. As reinforced concrete construction seemed to offer a new field for construction, he sought and found an opening with the Corrugated Bar Co., at that time in St. Louis, Mo. In 1906 he succeeded A. L. Johnson as chief engineer, and upon the latter's departure for an extended stay in Europe assumed the responsibility for the development of the engineering department, as well as new products and methods of construction. In 1910 he redesigned the deformed bar marketed by the company and introduced the round deformed bar for which he was granted letters patent. A number of other patents were granted him and exploited by the company, chief of which was the flat slab construction known to the trade as Corr-Plate floors. At the time the company moved its general offices to Buffalo, Mr. Lindau was made western manager in charge of the company's business in the middle west, which position he held until 1916 when he was called to Buffalo to become general manager of sales. In 1918 he was made a member of the Board of Directors, and in 1921 elected a vice president of the company.

* * *

Cooperative Work Among Products Men

Effective work that can be done by concrete manufacturers when they work together was reviewed by W. H Carey, president of the Wisconsin Concrete Products Association, at the convention which is being held in Milwaukee just as CONCRETE goes to press. One of the important things undertaken by members of the organization to build up the standard of quality of products made by the members is in securing tests of their products from accredited laboratories. Following these tests as an indication of the quality made, the manufacturer is given a certificate of quality from the National Concrete Products Association. This will do a great deal to build up quality on merchandising products. Reports of this work and of other activities of the organization go each month in the monthly digest of the organization not only to members but to all the concrete products manufacturers in the state.

It has been pointed out that while this is an excellent beginning, enabling manufacturers to get acquainted with the quality of their own products, examining into the causes for failure to attain certain quality, the next logical step will be an arrangement with a laboratory for a regular inspection service so that no certificate of quality will rest indefinitely upon one test performance. Tests should of course be made at frequent intervals from samples selected by an impartial laboratory inspector. The quality once attained does not always last, particularly in the busy season when products are being rushed through for waiting orders. When local products associations get stronger, work of this kind will undoubtedly be undertaken.

The Association assisted in an exhibit of concrete products at the Milwaukee Building Exposition last June and is financing another exhibit at the Wisconsin State Fair in September. The organization has also launched a direct by mail advertising campaign begun last September to run 28 weeks, ending in May next. This consists of specially prepared bulletins setting forth the advantages of concrete unit construction, each bulletin finely illustrated and going by first class mail every two weeks to every architect, realtor, builder, contractor, bank president, building and loan association in towns where members are located.

* * *

Committee Appointed to Make Cement Survey

The Secretary of Commerce has appointed an advisory committee to make, under the general direction of the Department of Commerce, a comprehensive survey of the properties and uses of cement and concrete. The Committee will cooperate with the Bureau of Standards and officials of the Department. The committee consists of:

John Lyle Harrington, Chairman, Engineer, Kansas City, Mo.; C. H. Boynton, cement manufacturer, New York City; N. Max Dunning, architect, Chicago; H. C. Turner, contractor, New York City; Charles M. Upham, highway engineer, Raleigh, N. C.

The cement industry has grown so rapidly and has achieved such great importance in the United States and the use of cement in the construction of roads, bridges and buildings has become so great and so diversified that the intelligent and appropriate use of this material becomes a matter of great economic interest to the public.

Research work is now being carried on by the Bureau of Standards and by various public and private research laboratories and commercial and professional organizations in the properties, characteristics and proper use of cement; in the improvement of methods, equipment and appliances tending toward improved efficiency and economy; the seasonal use of cement, especially in winter weather, important in its relation to continuity of employment of labor and the elimination of "peaks" and "depressions" and the spread of manufacture and distribution more evenly.

It is proposed through the survey to co-relate for the benefit of the industry and the public the results of such scientific and technical activities and to center in and under the direction of the Department of Commerce a thorough and disinterested study of the entire subject. It is believed that such concentration of effort as the committee proposes to bring about will produce material results in the elimination of wasteful duplication of effort, and effect savings to the public and result in benefit to the manufacturer.

Clifford Older

Clifford Older has resigned as chief engineer of the Illinois State Highway Department, to enter private practice, after more than 17 years with the department, since being made bridge engineer in 1906. He served in that capacity through two administrations and part of the third until Gov. Frank O. Lowden appointed him chief engineer in 1917. After graduation from the University of Wisconsin in 1900, Mr. Older's early experience was in railroad work with the Pennsylvania, the Wabash Pittsburgh Terminal and the Chicago & Alton. Here he handled track elevation, maintenance of way, tunnel construction, improvement of line and grade, railroad water supply systems and other work incidental to railroad construction and maintenance.

As bridge engineer in the Illinois Highway department, Mr. Older materially raised the standard of highway bridge design and construction, but his largest work has been the direction of the engineering incidental to carrying out the Illinois paving program, one of the largest ever undertaken. At the same time he has personally planned and directed the comprehensive series of highway research activities in connection with the Bates Test Road. This research attracted world-wide attention and the conclusions have led to fundamental changes in paving practice, far-reaching in their effect on the cost of construction and durability. Mr. Older has probably done as much as, if not more than, any other highway engineer by combining research theory and practice to put hard road design on a sound analytical and technical basis.

After Feb. 1, or as soon as his successor has been appointed, Mr. Older will devote his time to the Consoer Engineering Co., Chicago, the firm name being changed to Consoer, Older & Quinlan. This firm, of which Mr. Older has been president for some time past, has a general engineering practice specializing in the design and construction of water supply, sewerage and drainage systems, paving and bridges and industrial developments.

* * *

Fire-Resistive Interior Construction

While masonry of one kind or another is more and more replacing frame construction, frame houses will doubtless predominate for some time to come, at least outside the special fire hazard areas of the congested communities and while that continues an excellent measure of safety is in the proper uses of metal lath for plastering and for stucco (back plastered stucco without sheathing being stronger and cheaper).

When not used exclusively, metal lath will give considerable fire protection at vulnerable points and obviate costly repairs which follow plaster cracking.

It was pointed out by Wharton Clay, Commissioner of the Associated Metal Lath Manufacturers, in an address at the first National Fire Prevention Congress in New York, in October last that 96% of fires are confined to the place of origin. They are inside fires which inside fire checks must control. Mr. Clay said in reference to fire control by the use of metal lath:

> There is a type of partially protected fire-resistive construction which will give the greatest protection for the least extra cost. Expanded metal lath is used to protect the most vulnerable points which are:
>
> 1. On all stud bearing partitions and walls and fire stops between studs. (Fire stops to be metal lath basket shaped to fit between studs, coated with plaster or cement and filled with incombustible materials).
> 2. On ceilings under inhabited floors, especially over heating plants and coal bins.
> 3. At chimney breasts, around flues and back of kitchen ranges.
> 4. For stair-wells and under stairs.
> 5. Exterior walls.
>
> These are the positions in which the greatest probability of fire exists or the positions in which fire, if it does start, will do the greatest and quickest damage. While this is not an ideal or ultimate solution, its encouragement is a step in the right direction, and on account of the slight additional expense and the crack-resisting advantages can be more quickly advanced than complete protection. A house is being built in one of the suburbs of Chicago as a model of this type of construction. It is being built with the purpose of calling to the attention of the fire prevention world that a fire-resistive house can be built at little extra cost, along the most artistic lines, without deviating in the least from the requirements of the modern housewife as to exterior appearance or internal beauty. In fact, this house will be free from upkeep expense of repairing plaster cracks redecorating wall surfaces because of stains or dust marks following the contour of ordinary lath, and will be absolutely safe for the lives of the children who are to live in it. The extra cost will be not more than 2% of the cost of the building.

* * *

Hartness Heads Engineering Council

James Hartness, former governor of Vermont, and past president of the American Society of Mechnical Engineers, was elected president of the American Engineering Council to succeed Dean Mortimer E. Cooley of the University of Michigan, at the annual meeting of the Council, held in Washington, January 10 and 11. Addressing the council, President Hartness declared that his administration would be characterized by effort aiming to aid, through the engineering profession, the American people in making the best use of the nation's energies and resources. Vice presidents elected were L. P. Alford of New York and Charles R. Gow of Boston. Other vice presidents are Calvert Townley of New York and Gardner S. Williams of Ann Arbor, Mich. Dr. H. E. Howe of Washington was re-elected treasurer, and L. W. Wallace of Washington was again chosen executive secretary.

* * *

Drain Tile Men In Minnesota Work Together

About twenty of the larger concrete drain tile manufacturers in Minnesota have formed an organization and have employed a consulting engineer to look after their interests in meeting a situation caused by the alkali scare which competitive interests have been magnifying. Failures have been confined to Lyons and Redwood counties. D. G. Miller, Sr., Drainage Engineer, U. S. Dept. of Agriculture, also associated with the University of Minnesota Agricultural Department, has been making some investigations of concrete drain tile manufacture in order to find out if *and how* concrete tile can be made to resist these unusual and very much localized soil conditions. He has advised nothing definite as yet as to the result of his investigation. There are about 60 drain tile manufacturers in the state of Minnesota who are all at present interested in how to make the best drain tile. This necessarily covers the right kind of aggregate, mixing, steam curing and other manufacturing methods. The Minnesota producers have gone seriously at their problem, in the only sane and orderly way to find the answer.

The Semi-Annual Index to Vol. 23, CONCRETE, July to December, 1923, will be sent to those subscribers who ask for it.

Pipe Manufacturers Review Conditions

The American Concrete Pipe Association held one of its characteristic get-together and talk-it-over conventions in Chicago, January 17 to 19, without too much fixed program and with a great deal of the camaraderie which has given the organization its strength. G. H. Redding, secretary of the Massey Concrete Products Co., was elected president to succeed A. N. Shearman, who has held the office several years; and M. W. Loving continues as secretary.

Mr. Loving's report made a comprehensive summary of the progress of concrete pipe and drain tile in 1923. From it the following is abstracted:

Recent work of the organization has been confined largely to the promotion of the use of concrete pipe for sewer and culvert construction. Since the war, business in the drain tile field has been poor.

Efforts of the clay interests to introduce acid tests in the A. S. T. M. Sewer Pipe Specifications were successfully defeated—a compromise was agreed on in the form of a footnote to the concrete specifications, cautioning against its use for conveying sewage having an acid reaction.

In Lincoln, Nebraska, 3,720 feet of 51-in. reinforced concrete pipe were used to replace the same length of a 54-in. clay segment block outfall sewer that failed on or about June 2, 1923. While this is not the first example of such procedure, it is one of the outstanding examples of its kind. Reinforced concrete pipe has been extensively used for replacing a similar type of construction in Oklahoma City during this year, and in 1922. The Lincoln sewer had just been completed and had been in service only a few weeks when the collapse occurred. The selection of concrete pipe was the only alternative and the use of the smaller diameter of concrete pipe is recognition of its great carrying capacity, compared with the segment block type of sewer

During July or August 1923, the city of North Platte, Nebraska, received bids on plain or machine made concrete sewer pipe in competition with vitrified clay pipe. When the bids were opened the representative of the vitrified clay manufacturers arose in the meeting of the City Council and stated that his company had furnished pipe for the first sanitary sewers built in that city and he thought that they should be given the new work since their produce was an established material and was universally satisfactory. When he had finished, the Mayor advised him that the Street Commissioner had recently found it necessary to open the sewer in question due to stoppages, and the Commissioner was requested to describe the condition of the existing clay pipe sewers. The Commissioner being present, stated that about two-thirds of the pipe were broken or entirely collapsed. Needless to say, the new work was awarded to machine made concrete sewer pipe.

A large system of reinforced concrete pipe sewer was installed in Hammond, Indiana during the early spring of 1923, under adverse soil and weather conditions. Pipe from 24 to 108 in. internal diameter were successfully used and it is doubtful if any other material could have been used in building these sewers under the adverse conditions, particularly at that season of the year.

It is a fact that reinforced concrete sewer pipe is in most places considered the most modern and scientific material for constructing sewers from 24 to 108 in. internal diameter. It may be repeated at this time that the principal reason for this is that at the present time and in the past, a number of well managed and well financed concerns have placed this material on the market, and the public officials as well as the consulting engineers of the country, with very few exceptions, have great confidence in the material and the manufacturers. In practically all municipalities, this material is used on an equal basis with other types of construction, and in many cases it is specified exclusively. A committee of the American Bridge and Building Association, consisting of eight representatives of the principal railroads of the country, in 1923 placed reinforced concrete culvert pipe and cast iron pipe on an equal basis as to strength, permanence and economy. The report of this committee covers the experience of railroads of the country over a long period of time and a complete copy of this report is presented in the November 1923 issue of *Railroad Engineering* and *Maintenance.*

It is unfortunate that this same confidence is somewhat lacking in the case of plain or machine made concrete pipe. By many engineers it is termed "cement pipe" and is considered a different product from the reinforced variety. The cause of this lack of confidence is, of course, the result of the poorly managed and financed plants that started operations in various parts of the country in the early days, made poor pipe and failed. While many of these manufacturers, undoubtedly, thought they were making concrete of good quality, there was a tendency to use an insufficient amount of water to hydrate the cement, and consequently, a large percentage of the pipe was of questionable quality. The lack of standard specifications for this material was largely responsible for that condition. Two of the best examples of this situation are Brooklyn, N. Y. and Vancouver, B. C. This old pipe is being replaced with vitrified clay pipe at the present time, and such a condition is certainly a thorn in the sides of the responsible manufacturers who are today producing a pipe of excellent quality, and very far superior to the vitrified pipe.

It is not the intention to reflect on the responsible manufacturers of plain pipe, but the manufacturers themselves will recognize that this is the usual argument set forth by many engineers of the country today, and by our competitors as well. The facts in the case are, however, that the concrete used in fabricating the machine made pipe meeting A. S. T. M. specifications has a compressive strength of 4,000 to 6,000 lbs. per sq. in. as compared to the concrete used to make the cast pipe, which rarely exceeds 3,000 to 3,300 lbs. per sq. in.. The porosity of both classes of concrete is approximately the same. In at least ten large cities of the United States during this year, the writer has been told by the municipal officials and consulting engineers that they have no fear whatsoever of concrete pipe of good quality, but they have not much confidence in the manufacturers of this product in general. While they have great confidence in some of the larger firms, they are always afraid that there will be a possibility of some small operator shipping inferior pipe on to their work. While this confidence is gradually being built up by the operations of the larger manufacturers, the point is brought up at this time merely to emphasize the importance of making a special effort along this line. The firms that have been making this particular product on the Pacific Coast, particularly at Los Angeles and Portland, Oregon, have succeeded in building up this confidence. One of our members in Michigan has been operating over a period of ten years and has succeeded in selling its entire output not only to the smaller cities in Michigan, but to Grand Rapids and Detroit as well.

In the drain tile field, one of the outstanding accomplishments was the passage of a law by the state legislature of Minnesota, requiring that all tile produced or sold in the state of Minnesota pass the A. S. T. M. Standard Specifications. This was a result of the efforts of the leading manufacturers of drain tile in that state. Prior to this, it had been very hard for the responsible manufacturers to make a product of standard quality and compete with those who did not produce a product of good quality. One of the largest jobs on record was awarded in the state of Minnesota requiring 436 miles of tile from 4 to 36 in. internal diameter. A large per cent of the tile went for concrete.

Two meetings of Committee C-6, Drain Tile, of the American Society for Testing Materials were held during 1923, and certain advantageous improvements were made in the specifications.

An investigation of the hydraulic capacities of corrugated metal culvert pipe has been made at the Hydraulic Laboratory of the University of Iowa. Tests were made on corrugated metal pipe culverts 12, 18, 24 and 30 in. in diameter. To determine the effect of the length of culvert on the flow, the 24-in. pipe was tested in 24-, 30- and 36-ft. lengths. The other sizes were tested in 30-ft. lengths only. The experiments were conducted by C. D. Yarnell, Drainage Engineer, Bureau of Public Roads, U. S. Department of Agriculture, Sherman M. Woodward and Floyd A. Nagler, Professor and Associate Professor, respectively, of Department of Mechanics and Hydraulics, State University of Iowa.

The Bureau of Public Roads in 1922 published Bulletin No. 852 "The Flow of Water in Concrete Pipe." C. E. De Leuw of Kelker De Leuw & Co., Consulting Engineers of Chicago, Ill., published an article in *Municipal and County Engineering*[1], in which he compares the hydraulic capacities of corrugated metal and concrete pipe culverts. The article has been reprinted by this organization, and a wide distribution has been made. Briefly it shows that a 12-in. concrete pipe can be substituted for a 15-in. corrugated metal pipe, a 15-in. concrete pipe for an 18-in. corrugated metal pipe, etc.

It is recognized, of course, that this information is of great benefit to the manufacturers of concrete culvert pipe and every effort should be made by our manufacturers to bring these facts before the various designing engineers and state and county commissioners. Since corrugated metal pipe is rarely used for railroad culverts, it is hardly necessary to take this matter up with the railroad officials.

The Joint Concrete Culvert Pipe Committee has been inactive during 1923, since the appropriation for culvert pipe investigations at the Iowa State College, had been somewhat curtailed. A meeting of this Committee will be held in Chicago the latter part of February. It is not expected, however, at that time, that specifications for railroad and highway culvert pipe will be agreed upon by the committee.

If you have used a "kink" on your job, trade it for another through CONCRETE.

Road Show Huge and Colorful

Who missed the Chicago Road Show, held last month in connection with the 21st annual convention of the American Road Builders' Association, missed a huge and colorful industrial fair which in its special field compared favorably with the national automobile shows in the automotive industry.

"Huge" is the word, because the exhibits filled the time-worn Coliseum, its balcony, two floors of the Coliseum Annex, the Greer Building and the Wilson Building adjoining, while manufacturers, unable to secure show space, packed Wabash avenue with trucks bearing impromptu exhibits.

"Colorful" is the word because the show management went the limit to lend romance to locomotive cranes and decked the show in yellows and reds and purples with an effect far more pleasing than might be imagined.

Exhibitors caught the gala spirit and dolled up their scarifiers and asphalt tanks. The regulations were rigid with reference to the orderly arrangement of the thousands of tons of oddly shaped ponderous equipment and so successful were they that great batteries of such engines of peace as steam shovels were arrayed in line like engines of war on parade. Actual harmony was secured—an achievement of note when the miscellaneous character of the statuary is considered.

Chicago offered her usual welcome to the show. This thought is endorsed by the earnest exhibitor who is said to have approached his own road roller with a can of white paint and the simple purpose to paint the steering-gear. It is said a union labor representative called attention to Rule Umpsteen, requiring that all painting be done by a union painter so the exhibitor profanely agreed to pay two Chicago union men to sit by, on pay, while he himself painted the rig.

Those readers of this magazine who remember as far back as 15 years, and who attended last month's show, found many familiar things beside the union painters to remind them of the old Cement Shows. This business of running industrial shows is rapidly becoming a science. The Highway Industries Exhibitors Association, which runs the road show, is to be congratulated upon the smooth and efficient management of the exhibition and the American Road Builders' Association may congratulate itself upon the arrangement by which the show is managed by the exhibitors. There's no denying the fact that it's the show that attracts most of the convention visitors to the city where both are held.

There were no startling innovations in the equipment shown. There was a deal of very heavy stuff, but the limit of weight seems to have been reached and in some lines could be distinguished a tendency on the part of designers to use stronger, lighter metals, achieving greater ease of portability.

The corn-sheller school of road machinery manufacture seems to be petering out. The show revealed very few machines of angle-iron and galvanized sheets, so common a few years ago. Today the road-builder is offered strong, durable machinery that may reasonably be expected to last several seasons even with just ordinary care

The tractor type of multiple cylinder gasoline motor was more in evidence this year than last. Safety devices, danger signals and patented road markers proved the serious attention being paid to safety on the highways. The U. S. Bureau of Public Roads did itself proud with an educational exhibit so complete and so thorough that it is feared many who should have availed themselves of the opportunity to absorb it merely skimmed it over for lack of time.

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[1] Also see CONCRETE, January 1924

Last year's show registered about 6000 visitors for the week. The attendance at the 1924 show passed the 6000 mark before the exhibit was 24 hours old and every day thereafter added thousands more.

The exhibitors voted tentatively to hold the show in Chicago in 1925—with an "if." Here's the proviso: "If satisfactory hotel accommodations are obtainable and suitable quarters for the show can be secured." The American Road Builders' Association passed the same resolution with reference to its 1925 convention.

Having lost both national political conventions this year, perhaps Chicago will stretch itself a bit to hold what is undoubtedly one of the most important industrial exhibitions regularly held in this country.

What Contractors Want and Don't Want

The Associated General Contractors of America in their convention just recently closed summed up many of the foremost questions before the meeting with resolutions.

They protested against the abuse of bonds given to contractors who are obviously incapable of performing their contract, or who have obviously demonstrated that they cannot be relied upon to carry out their obligations in good faith. They join with the American Association of Highway officials and representatives of the surety companies for complete and impartial analysis of the bonding situation, seeking to find a proper solution for the issues confronting both the bonding companies and the contractors.

Protests were entered against the growing public use of the day labor method of construction. It was pointed out that this method is full of notorious instances of excessive cost and the contractor organization urges its membership throughout the country to accept as a basic duty a campaign of publicity to show the results of the day labor method of doing public construction and to enter upon a vigorous and persistent effort to secure legislation which will require public bodies to do public construction by the sound method of firm contracts guaranteeing completion at a fixed price.

The contractors endorsed the object of the newly established Inter-departmental Board of Contracts and Adjustments and offer assistance to the new bureau in every way possible toward simplification of government contracts.

Cutting "red tape" in government contracts, was the task assigned Gordon A. Ramsey, Chicago lawyer, when he was called to Washington by Gen. Charles Gates Dawes, the first director of the Bureau of the Budget. Mr. Ramsay was appointed assistant to the director and his specific work was to become chairman of and to organize the Inter-departmental Board of Contracts and Adjustments. Rather a high-sounding name, but, in plain English, the board is trying to "humanize" contracts between the government and the people who do things for the government.

Mr. Ramsay has succeeded in securing the adoption of the first standardized government contract ever adopted by our government —a government lease, which is now used by all the departments where the government is a tenant, eliminating all of the unfair clauses heretofore included, notably the clause giving the government only the right to cancel without cause on thirty days' notice. The government's rent roll approximates twenty-two million dollars per year.

Under Mr. Ramsay's supervision, compilations of the following have been completed: Decisions of the Supreme Court of the United States, the Court of Claims, the Attorney General and the Federal statutes relating to government contracts, also a tentative standardized work or construction contract, modernized as far as the present laws will permit, and similarly a tentative contract relating to supplies.

Mr. Ramsay and the Board are working on a draft of a new public contract federal law, suggestions regarding which he welcomes from contractors, architects, engineers, with a view to ultimately having the contract procedure of the government as nearly in accord with that of commercial usage as possible.

Reviewing the stand which was previously taken on abuses in the contracting fraternity, such for instance as those which have been cleaned up by the Citizens Committee of Chicago, the Associated General Contractors point out that certain large concerns operating widely throughout the United States are now engaged in making deals with discredited labor organizations and otherwise acting in a manner calculated to jeopardize the gains made by the Citizens Committee in Chicago. A resolution was passed that "such deplorable opportunism which has in the past led some contractors to destroy the just labor conditions which have been built up locally by others is a matter that should receive sweeping condemnation of the Associated General Contractors." It was further resolved that bankers, property owners and fiduciary institutions be informed by the Associated General Contractors in no uncertain terms of their own share in the responsibility of the matters here discussed.

Secretary Mellon's tax revision plan was endorsed and its early passage by Congress urged without modification.

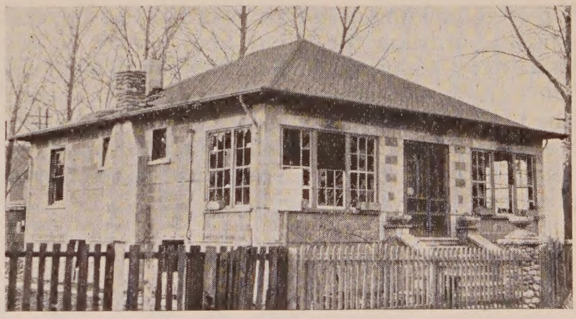
The contractors heartily approve the movement for a reorganization in the Federal department and endorse grouping and coordinating within one department, preferably named a Department of Public Works, all construction and administration of all non-military public works.

They recognize the growing evil of use of the public highways for transporting passengers and commodities by large private transportation companies who do not share in the cost to the community of the highways which they use. They recommended to the members that efforts and influence be used to secure in their respective states such legislation as would tend to correct this inequity.

A resolution was passed indicating it to be the opinion of the Associated General Contractors that any material changes in the transportation act at this time would be injurious to the efficiency of the railway service and the prosperity of the country as a whole Cooperation was urged with the American Construction Council, educational institutions and local associations, in the establishment of apprenticeships and in the actual training of apprentices.

A resolution was passed calling attention to the fact that difficulties in construction are greatly increased and many disputes arise during the progress of the work due to the fact that plans, specifications and bidding information have not been supplied in sufficient detail.

Frederick L. Cranford, Brooklyn, New York, was elected president. Mr. Cranford is president of Frederick L. Cranford, Inc. He succeeds John W. Cowper of Buffalo. A. S. Downey, Seattle, Washington, was elected vice president at large. Other new vice presidents —Leonard C. Wason, Boston; H. H. Wilson, Harrisburg, Pa. Directors—W. A. Rowan, New York City; T. J. Baker, Milwaukee, Wisconsin; Henry Ericsson, Chicago; Natt MacDougal, Portland, Oregon; and H. W. Baum, Salt Lake City.



A Bootlegger's Fortress of Concrete

Every business must be adequately protected; the more precarious the business, the greater the precautions that must be taken. No one knows better than the proprietors themselves that the operation of a "still" business can only be undertaken with maximum precautionary measures; even then all dangers are not eliminated. Newspaper accounts indicate that certain Revere, Mass., "business men" were on the right track; they had their headquarters within concrete masonry walls, which were not destroyed when their equipment exploded. Replacement of broken windows and of interior finish is all that is necessary to rehabilitate the house, for the force of the explosion and the resulting fire did not in the least harm the concrete block.

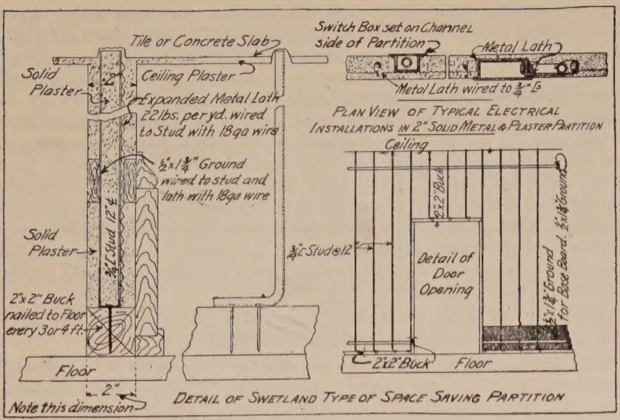

Tile or Concrete Slab
Solid Plaster
2"
Ceiling Plaster
Expanded Metal Lath 22 lbs. per yd. wired to Stud with 18 ga wire
½x1¾" Ground wired to stud and lath with 18 ga wire
¾" ⌐ Stud 12" ⌐
Solid Plaster
2"x2" Buck nailed to Floor every 3 or 4 ft.
Floor
2"
Note this dimension
Switch Box set on Channel side of Partition
Metal Lath
Metal Lath wired to ¾" ⌐s
Plan View of Typical Electrical Installations in 2" Solid Metal & Plaster Partition
Ceiling
2"x2" Buck
¾" ⌐ Stud @ 12"
Detail of Door Opening
½"x1¾" Ground
½"x1¾" Ground for Base Board
2"x2" Buck
Floor
Detail of Swetland Type of Space Saving Partition

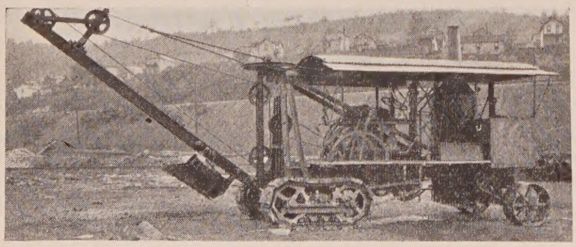
Fig. 1—Details of the Swetland Type of Partition. Re-Drawn from a Copyrighted Drawing

Space-Saving Partition

The standardized 2-in. solid plaster, metal lath partition for office buildings shown below was designed by the Swetland Co., Cleveland, O., in cooperation with the Cleveland Association of Building Owners and Managers and the Associated Metal Lath Mfgrs. This type of partition has been used successfully in several Cleveland office buildings. It not only saves space, but it is economical to erect and has several distinct advantages over partition tile and some of the other types of partitions. This partition has been very cleverly worked out and permits of easy removal in case of changing tenancies. The novelty lies in the strip of wood that is placed upon the finished floor, a complete innovation in the art of partition building.

The illustration shows the detail of construction. Attention, however, is directed to the fact that the wood grounds may be nailed together by long nails, bent over and clinched. The drawing shows the grounds wired to each side of the stud.

If picture molding or cornice is erected at the ceiling line instead of below the ceiling line, it may be advisable to have a 2-in.x2-in. buck at the ceiling. The channel studs may be attached to the floor buck by boring holes ¾ in. in diameter in the buck and inserting the stud in these holes. This method would save bending the stud. It is essential to have a steel channel stud on each side of the door buck.



Keystone With Front Crawler

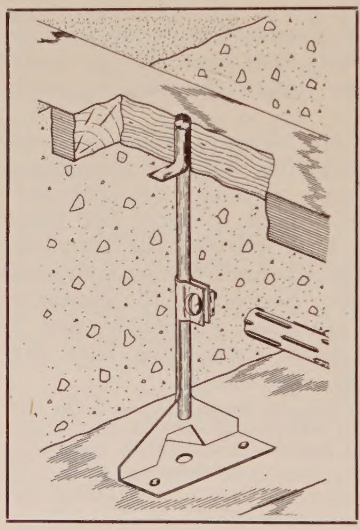
The Keystone Shovel is preparing to celebrate its tenth anniversary by coming out on half caterpillar mounting. The Model 4-24, illustrated herewith, weighs 15 tons as a wheel traction, and 16 tons mounted on front crawlers. It is regularly equipped with a 40- x 86-in. boiler, either vertical fire tube or cross tubular type. On the front crawler machine the sills are extended 22 in. to accommodate the steering wheels at the boiler end. The machine can be furnished with electric-motor or gas-engine drive when so desired.

The ⅝-yard skimmer bucket has an exceptionally long horizontal crowd—14 ft.—which renders it peculiarly adaptable to street and road excavation. It is possible to change from one bucket to the other in a few minutes' time. By the use of a boom-extension, the machine can be arranged to handle a ½-yd. clamshell bucket.

The crawler tread is mounted under the digging end of the machine, which, of course, is subject to the greatest weight, strains and digging stresses. So equipped, the machine can be navigated over any material of sufficient stability to carry a caterpillar traction.

M. & M. Target

The M. & M. Target (M. & M. Wire Clamp Co., 2 Fifth St., S. E. Minneapolis, Minn.) is a simple, rigid device for levelling concrete, shown in the accompanying sketch. Sixty-penny spikes or ¼-in. rods of the required length may be used. It is common to put on a small piece of wire to serve as a flag should the head of the spike become covered. Targets are made up on the job. The manufacturers say that a man will make up four or more a minute to exact height. They may also be used as pivot points to turn on with screeds levelling the concrete, or with caps will hold screed strips in place, as shown in the illustration.



A New Household Water Softener

A new household water softener described as the Duro Upward Flow Water Softener has been announced by the Duro Pump & Mfg. Co., Dayton, Ohio. This equipment is a mechanical water softener which may be connected to the service line entering the home in such a manner as to permit the water from the water main to pass through a mineral bed under pressure, hence direct to the faucets. No cistern or separate water supply is required.

It is claimed by the manufacturers that when connected in the water supply line, the mineral or sand has the peculiar property of extracting lime and magnesia from the water immediately thus converting it into zero soft water.

Particular advantages claimed for the Duro household water softener include: upward softening, which prevents the mineral from packing and becoming hard; separate cast iron salt pot, equipped with a strainer to prevent lint and dirt from getting into the tank; regenerating accelerated, due to the upward softening which requires less salt in regenerating than other types; efficiency of Duro mineral of the natural rapid-rate quick-acting type which does not give off red stains and lasts indefinitely.

At the End of Twenty-Five Years

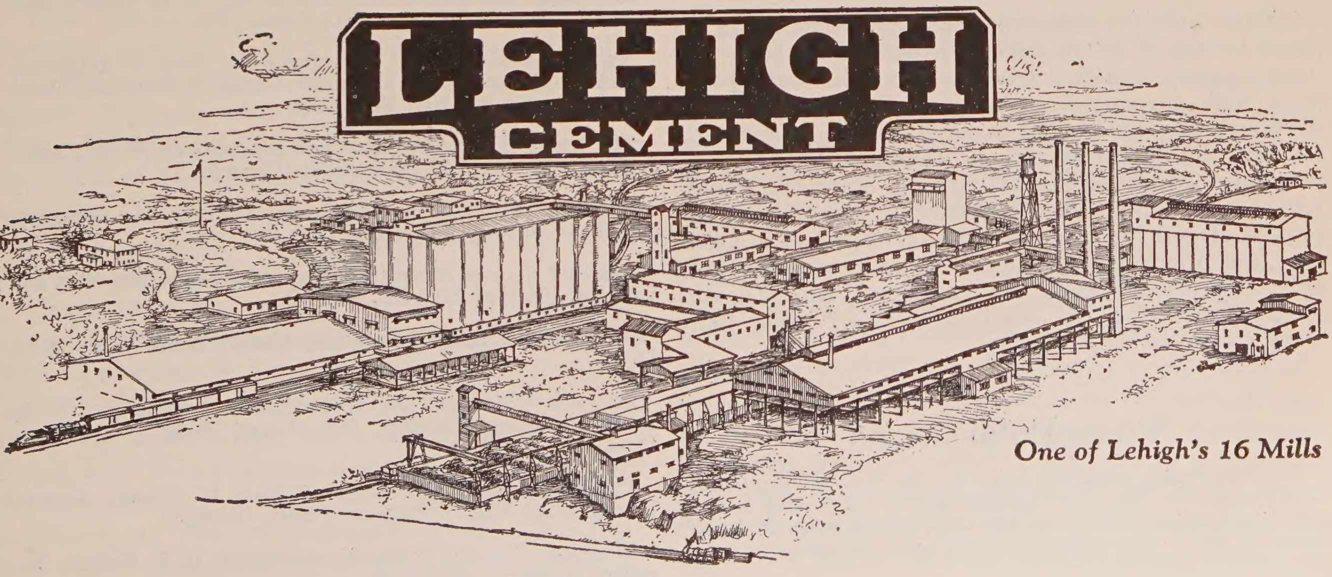
Lehigh-The National Cement

Not the oldest but -
The largest in the world
With widest distribution
Unequalled service facilities
Largest storage capacity
Original ownership
16 mills from coast to coast
Uniform quality everywhere

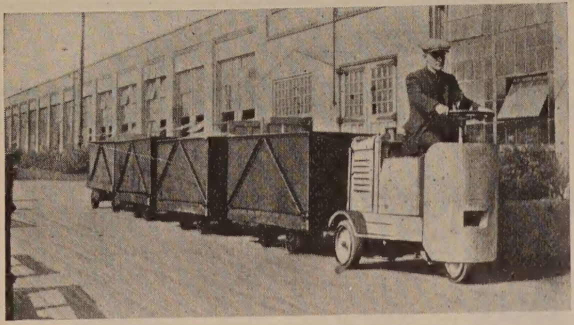
These are significant facts. They show a growth made possible by the confidence and support of thousands of Lehigh dealers and users. To all these friends we give grateful acknowledgment and a pledge of constant effort to serve.

LEHIGH PORTLAND CEMENT COMPANY
ALLENTOWN, PA. CHICAGO, ILL.
BIRMINGHAM, ALA. SPOKANE, WASH.

NEW YORK, N. Y. BOSTON, MASS. PHILADELPHIA, PA.
BUFFALO, N. Y. NEW CASTLE, PA. PITTSBURGH, PA.
KANSAS CITY, MO. MASON CITY, IOWA MINNEAPOLIS, MINN.
OMAHA, NEB. RICHMOND, VA.



One of Lehigh's 16 Mills



The Smallest Tructractor

The Duat, claimed to be the smallest industrial truck and tractor ever built, has just been announced by the Clark Tructractor Co., 119 Days Ave., Buchanan Mich., manufacturers of gasoline industrial trucks and tractors.

The Duat tructractor is a compact, three-wheeled, gasoline-powered mobile crane, truck and tractor. It pivots on one wheel, has a turning radius of but 52 in. and turns around in a box car. It is an inexpensive general utility haulage unit.

The Duat tructractor tows from 7 to 10 tons or from 1 to 20 trailers, depending on the condition of the factory floor or yard. Through an ingenious device, a 1-ton crane is attached without the use of tools, in less than five minutes, converting the Duat into a mobile crane. The crane attachment will lift and carry loads up to 2,000 lbs. A brake device permits the load to be carried at any height up to 56 in.; load may be lowered at will. The machine has been designed for the loading and unloading of box cars, the lifting and towing of loads through narrow factory aisles, and for inter-plant haulage.

The Duat has a wheelbase of 40 in. with a tread of 33 in. A brake beneath the driver's seat, which automatically stops the machine when the driver dismounts, is a safety factor.

The Duat is designed to answer a thousand needs for the craning and transporting of materials in and about industrial plants, railroad stations and terminals, machine shops, clay plants, mills, warehouses, docks and storage yards.

A New Plaster Base

Thermolath is a comparatively new product. It is made by the Waldorf Paper Products Co. It is in itself a paper product, a felt-like material about ½ in. thick with dovetailed corrugations offered as a base for plaster and stucco and to serve also for deadening, for heat insulation and as a waterproofing. It is recommended by the manufacturer in doing the whole job at one trick.' They recommend, when portland cement stucco is used, that poultry netting be used over the Thermolath, in order to reinforce the slab and minimize cracking. It is applied with 1¼-in. roofing nails over the sheathing. Every other lath being nailed on 12-in. centers.

Trade Publications

The Fireproofing Handbook issued by the General Fireproofing Co., Youngstown, Ohio, is a book dealing with the problem of fireproof construction using as a basis the fireproofing material, self centering, trussit, expanded metal, metal lath, steel lumber and steel tile. The book is 8½ in. x 11 in.; 72 pages; paper covers. It is fully illustrated, showing details of methods recommended in using the General Fireproofing Company's material. Useful tables for the design of reinforced concrete are included.

A copy of the Fireproofing Handbook will be sent to anyone directing a request for it to the Youngstown, Ohio, office of the General Fireproofing Co.

Heltzel Armor Plate Steel Road Form, Heltzel Steel Form and Iron Company, Warren, Ohio. Twelve pages illustrating and describing in detail the makeup and use on the job of an improved road form. The Heltzel road rail has not been changed but the joint has been perfected with heavy steel reinforcing with two strong steel stake pockets. The joint reinforcing bar is 15-in. long with a stake pocket at either end.

Quality Dumping Equipment and the *New Gravity Dump Body for Roadmaking* are described in two new circulars of the Heil Company, Milwaukee, Wisc. These illustrate and describe dumping equipment for heavy and light haul, including the Heil-Ford Dump-Quick equipment.

Armoboard Reinforced Concrete Garages, The Armoboard Co., Long Avenue, Hillsdale, N. J. Armoboard is a reinforced concrete side wall building material precast in panel sections, each section bearing its own frame, a reinforced sill, plate and side studs. Side studs of adjacent sections are joined by an interlocking key to form a weatherproof joint. Two side studs joined give sufficient strength to carry the roof load. Armoboard is patented in both design and composition and consists of asbestos fibre, sand, portland cement and other mineral ingredients.

Organizations

American Concrete Institute; Harvey Whipple, Secretary, 1807 East Grand Boulevard, Detroit. Convention February 25 to 28, incl., 1924, Drake Hotel, Chicago.

American Concrete Pipe Association; M. W. Loving, Secretary, 111 West Washington St., Chicago. January 17-19, Sherman Hotel, Chicago.

American Engineering Standards Commission; Dr. P. G. Agnew, Secretary, 29 W. Thirty-ninth Street, New York City.

Associated General Contractors of America; G. W. Buchholz, Secretary, 1038 Munsey Bldg., Washington, D. C. January 21-23, Chicago.

Associated Metal Lath Manufacturers; 123 W. Madison St., Chicago; Wharton Clay, Commissioner.

Building Officials Conference; Rudolph P. Miller, President, Fred W. Lumis, City Hall, Springfield, Mass., Secretary.

Iowa Cement Stave Silo Association; H. E. Kilmer, Secretary, Oskaloosa, Ia.

Iowa Concrete Products Association; Ross Dowell, Secretary, 405 Hubbell Bldg., Des Moines.

Mid-West Concrete Products Association; D. R. Donlen, Secretary-Treasurer, 4340 Marcy St., Omaha, Neb.

National Association of Manufacturers; John E. Edgerton, President; Henry Abbott, Treasurer; George S. Boudinot, Secretary, 50 Church St., New York City.

The National Concrete Stave Silo Association; W. G. Kaiser, Secretary, 111 West Washington St., Chicago.

National Crushed Stone Association; A. P. Sandles, Secretary, 405 Hartman Bldg., Columbus, Ohio.

National Housing Association; Lawrence Veiller, Secretary and Director, 105 East 22nd St., N. Y. C.

The National Lime Association; Mather Bldg., Washington, D. C.

National Sand and Gravel Producers' Association; T. R. Borrows, Acting Secretary, 903 Munsey Bldg., Washington, D. C.

Portland Cement Association; William M. Kinney, General Manager, 111 West Washington Street, Chicago.

Wisconsin Concrete Products Association; D. R. Collins, Secretary-Treasurer, Milwaukee.